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(71)Applicant : CANON INC

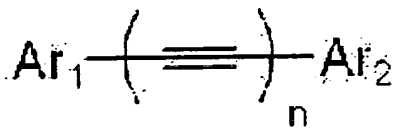
(72)Inventor : YAMADA NAOKI
SAITO AKITO
SUZUKI KOICHI
SENOO AKIHIRO
TANABE HIROSHI
HIRAOKA MITSUO
NEGISHI CHIKA

(54) ORGANIC LIGHT EMITTING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an organic light emitting element presenting an extremely high purity luminescent color phase and having an optical output of high efficiency and high luminance with a long life.

SOLUTION: In an organic light emitting element constituted of a positive electrode and a negative electrode and one or a plurality of layers of organic compound layers interposed between a pair of the electrodes, at least one layer out of the organic compound layers contains at least one kind of a compound as expressed by a general formula [1]. Provided that, in the general formula [1], Ar1, Ar2 express substituted or unsubstituted aryl groups, substituted or unsubstituted heterocyclic groups, substituted or unsubstituted fused polynuclear aromatic groups, substituted or unsubstituted fused polynuclear heterocyclic groups, substituted or unsubstituted alkyl groups, substituted or unsubstituted aralkyl groups, substituted or unsubstituted alkoxy groups, substituted amino groups, or cyano groups, and may be the same or different. n shows an integer of 1-5.



[1]

LEGAL STATUS

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[Date of extinction of right]

* NOTICES *

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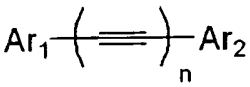
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

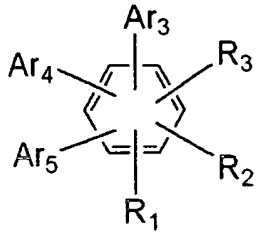
CLAIMS

[Claim(s)]
[Claim 1]
The organic light emitting device characterized by at least one of said organic compound layers containing at least one kind of compound shown by the following general formula [1] in the organic light emitting device which consists of organic compound layers (one layer or two or more layers) ****(ed) by an anode plate and cathode, and inter-electrode [of these couples].
[Formula 1]



[1]

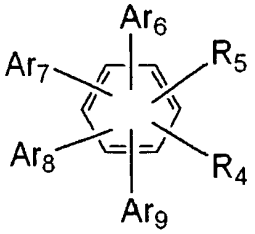
(Among the formula, Ar1 and Ar2 express the alkoxy group which is not permuted [the aralkyl radical which is not permuted / the alkyl group which is not permuted / the condensed multi-ring heterocycle radical which is not permuted / the condensed multi-ring aromatic series radical which is not permuted / the heterocycle radical which is not permuted / the aryl group which be permuted / a permutation or / a permutation, or, a permutation, or /, a permutation, or /, a permutation, or / a permutation, or /, a permutation, or /, the permutation amino group, or a cyano group, and even if the same, they may differ.) n shows the integer of 1-5.
[Claim 2]
The organic light emitting device according to claim 1 characterized by the layer containing the compound shown by said general formula [1] containing the compound further shown by at least one kind of following general formula [2].
[Formula 2]



[2]

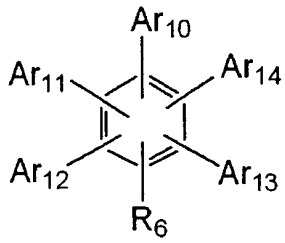
(Among the formula, R1-R3 express the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group a permutation, or /, a permutation, or / a permutation, or], the permutation amino group, a cyano group, or a halogen atom, and even if the same, they may differ.) Ar3-Ar5 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and even if the same, they may differ.
[Claim 3]
The organic light emitting device according to claim 1 characterized by the layer containing the compound shown by

said general formula [1] containing the compound further shown by at least one kind of following general formula [3].
[Formula 3]



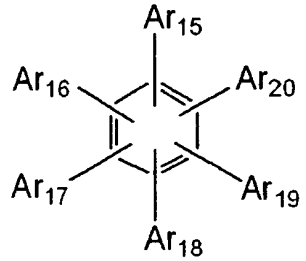
[3]

(Among the formula, R4 and R5 express the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group a permutation, or /, a permutation, or / a permutation, or], the permutation amino group, a cyano group, or a halogen atom, and even if the same, they may differ.) Ar6-Ar9 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and even if the same, they may differ.
[Claim 4]
The organic light emitting device according to claim 1 characterized by the layer containing the compound shown by said general formula [1] containing the compound further shown by at least one kind of following general formula [4].
[Formula 4]



[4]

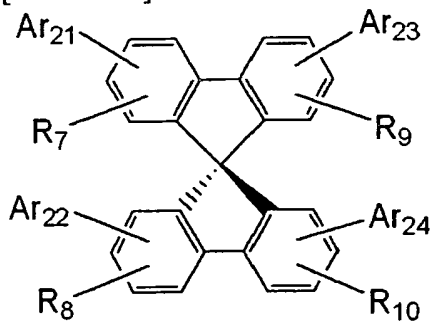
(R6 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, a cyano group, or a halogen atom.) Ar10-Ar14 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and even if the same, they may differ.
[Claim 5]
The organic light emitting device according to claim 1 characterized by the layer containing the compound shown by said general formula [1] containing the compound further shown by at least one kind of following general formula [5].
[Formula 5]



[5]

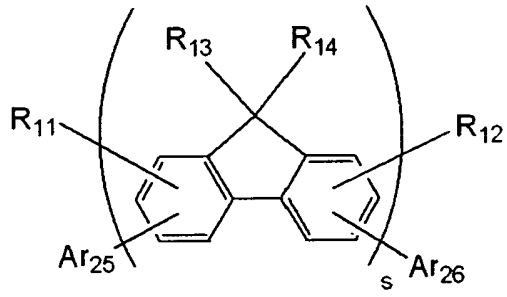
(Among the formula, Ar15-Ar20 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and even if

the same, they may differ.)
[Claim 6]
The organic light emitting device according to claim 1 characterized by the layer containing the compound shown by said general formula [1] containing the compound further shown by at least one kind of following general formula [6].
[Formula 6]



[6]

(Among the formula, Ar21-Ar24 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a hydrogen atom, a permutation or /, a permutation, or], and even if the same, they may differ.) R7-R10 express the alkoxy group which is not permuted [the heterocycle radical which is not permuted / the aryl group which is not permuted / the aralkyl radical which is not permuted / the alkyl group which is not permuted / a hydrogen atom, a halogen radical, a cyano group, a permutation, or /, a permutation, or /, a permutation, or /, a permutation, or /, a permutation, or] or the permutation amino group, and even if the same, they may differ.
[Claim 7]
The organic light emitting device according to claim 1 characterized by the layer containing the compound shown by said general formula [1] containing the compound further shown by at least one kind of following general formula [7].
[Formula 7]



[7]

(You may differ, even if R13 comrades and R14 comrades which R13 and R14 express among a formula the aryl group which is not permuted [the aralkyl radical which is not permuted / the alkyl group which is not permuted / a hydrogen atom, a permutation or / a permutation, or /, a permutation, or], and are combined with a different fluorene radical may be the same and R13 and R14 which are combined with the same fluorene radical are the same.) R11 and R12 express the alkoxy group which is not permuted [the aralkyl radical which is not permuted / the alkyl group which is not permuted / a hydrogen atom, a permutation, or /, a permutation, or /, a permutation silyl radical, a cyano group, a permutation, or], and even if the same, they may differ. Ar25 and Ar26 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and even if the same, they may differ. s shows the integer of 1-10.
[Claim 8]
The organic light emitting device according to claim 1 to 7 characterized by the layer containing the compound shown by said general formula [1] being a luminous layer.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Field of the Invention]
[0001]
This invention relates to the component which emits light by impressing electric field to the thin film which consists of an organic compound in detail about an organic light emitting device.
[Background of the Invention]
[0002]
An organic light emitting device is a component using the light emitted in case the exciton of a fluorescence compound is made to generate and this exciton returns to a ground state by making the thin film containing a fluorescence organic compound pinch, and pouring in an electron and a hole (electron hole) from each electrode between an anode plate and cathode.
[0003]
In about [10V] applied voltage, luminescence of about [1000cds //m] two is reported by the component of the functional discrete-type two-layer configuration which used ITO for the anode plate, used the alloy of magnesium silver for cathode in research (nonpatent literature 1) of KODAKKU in 1987, respectively, and used the triphenylamine derivative for the hole transport ingredient, using an aluminum quinolinol complex as an electronic transport ingredient and a luminescent material. As a patent of relation, the patent reference 1 - 3 grades are mentioned.
[0004]
Moreover, by changing the class of fluorescence organic compound, luminescence from ultraviolet to infrared rays is possible, and, recently, research of various compounds is done actively. For example, it is indicated by the patent reference 4 - 11 grades.
[0005]
Furthermore, the organic light emitting device which used the conjugated-system giant molecule other than an organic light emitting device using the above low-molecular ingredients is reported by the group (nonpatent literature 2) of Cambridge University. By this report, luminescence is checked by the monolayer by forming polyphenylene vinylene (PPV) by the coating system. As a related patent of the organic light emitting device using a conjugated-system macromolecule, the patent reference 12 - 16 grades are mentioned.
[0006]
Thus, the latest advance in an organic light emitting device is remarkable, and the description has suggested the possibility from the versatility of high brightness and luminescence wavelength, high-speed responsibility, a thin shape, and the lightweight formation of a luminescence device being possible to an extensive application with low applied voltage. However, there are still many problems in respect of endurance, such as degradation by an ambient atmosphere gas, moisture, etc. containing aging and oxygen by activity of long duration.
[0007]
When the application to a full color display etc. is furthermore considered, the blue of the optical output of the further high brightness or high conversion efficiency, and high color purity, green, and red luminescence are required of the actual condition. For example, although the diamine compound is indicated by the patent reference 17 as a luminescent material, blue luminescence of high color purity (chromaticity coordinate: x, y= 0.14 to 0.15, 0.09-0.10) is not

obtained. Moreover, as an example which used the compound which has the same diamino frame, although the patent reference 18 is indicated, it is used as a hole injection layer and indicated about luminescence properties, such as the activity and the luminescent color as a luminous layer, and effectiveness.

[0008]

[Patent reference 1] U.S. Pat. No. 4,539,507 number description
[Patent reference 2] U.S. Pat. No. 4,720,432 number description
[Patent reference 3] U.S. Pat. No. 4,885,211 number description
[Patent reference 4] U.S. Pat. No. 5,151,629 number description
[Patent reference 5] U.S. Pat. No. 5,409,783 number description
[Patent reference 6] U.S. Pat. No. 5,382,477 number description
[Patent reference 7] JP,2-247278,A
[Patent reference 8] JP,3-255190,A
[Patent reference 9] JP,5-202356,A
[Patent reference 10] JP,9-202878,A
[Patent reference 11] JP,9-227576,A
[Patent reference 12] U.S. Pat. No. 5,247,190 number description
[Patent reference 13] U.S. Pat. No. 5,514,878 number description
[Patent reference 14] U.S. Pat. No. 5,672,678 number description
[Patent reference 15] JP,4-145192,A
[Patent reference 16] JP,5-247460,A
[Patent reference 17] JP,2001-52868,A
[Patent reference 18] JP,2001-196177,A
[Nonpatent literature 1] Appl.Phys.Lett.51,913(1987)
[Nonpatent literature 2] Nature,347,539(1990

[Description of the Invention]

[Problem(s) to be Solved by the Invention]

[0009]

This invention is made in order to solve the trouble of such a conventional technique, it presents a luminescent color phase with very sufficient purity, is efficient and is to offer the organic light emitting device which has the optical output of high brightness and a high life. It is in offering the organic light emitting device which manufacture can furthermore create comparatively cheaply easily.

[Means for Solving the Problem]

[0010]

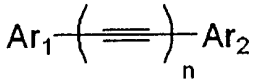
In order to solve an above-mentioned technical problem, as a result of inquiring wholeheartedly, it came to complete this invention.

[0011]

That is, the organic light emitting device of this invention is characterized by at least one of said organic compound layers containing at least one kind of compound shown by the following general formula [1] in the organic light emitting device which consists of organic compound layers (one layer or two or more layers) ****(ed) by an anode plate and cathode, and inter-electrode [of these couples].

[0012]

[Formula 1]



[1]

[0013]

(Among the formula, Ar1 and Ar2 express the alkoxy group which is not permuted [the aralkyl radical which is not permuted / the alkyl group which is not permuted / the condensed multi-ring heterocycle radical which is not

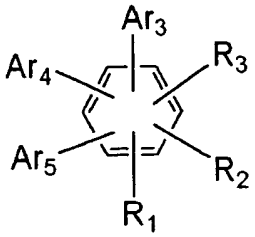
permuted / the condensed multi-ring aromatic series radical which is not permuted / the heterocycle radical which is not permuted / the aryl group which be permuted / a permutation or / a permutation, or, a permutation, or /, a permutation, or /, a permutation, or / a permutation, or /, a permutation, or /, the permutation amino group, or a cyano group, and even if the same, they may differ.) n shows the integer of 1-5.

[0014]

The organic light emitting device of this invention contains the mode in which the layer containing the compound shown by said general formula [1] contains the compound further shown by at least 1 kind of following general formula [2] - [7].

[0015]

[Formula 2]



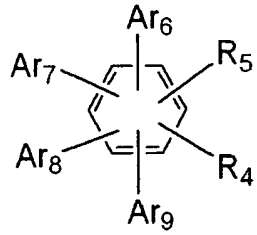
[2]

[0016]

(Among the formula, R1-R3 express the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group a permutation, or /, a permutation, or / a permutation, or], the permutation amino group, a cyano group, or a halogen atom, and even if the same, they may differ.) Ar3-Ar5 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and even if the same, they may differ.

[0017]

[Formula 3]



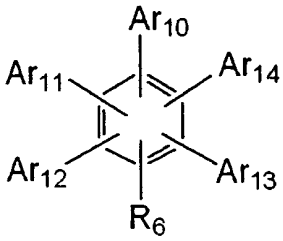
[3]

[0018]

(Among the formula, R4 and R5 express the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group a permutation, or /, a permutation, or / a permutation, or], the permutation amino group, a cyano group, or a halogen atom, and even if the same, they may differ.) Ar6-Ar9 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and even if the same, they may differ.

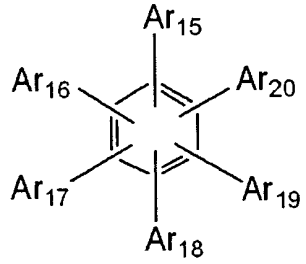
[0019]

[Formula 4]



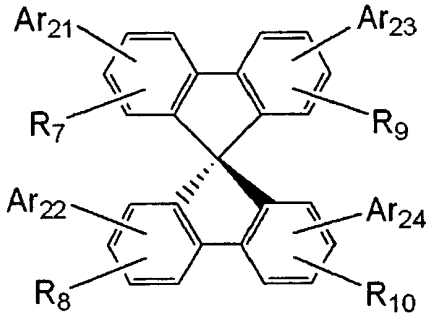
[4]

[0020]
(R6 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, a cyano group, or a halogen atom.) Ar10-Ar14 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and even if the same, they may differ.
[0021]
[Formula 5]



[5]

[0022]
(Among the formula, Ar15-Ar20 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and even if the same, they may differ.)
[0023]
[Formula 6]



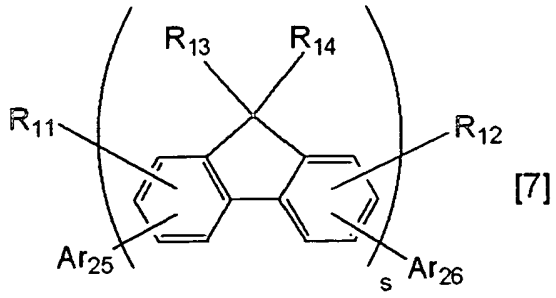
[6]

[0024]
(Among the formula, Ar21-Ar24 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a hydrogen atom, a permutation or /, a permutation, or], and even if the same, they may differ.) R7-R10 express the alkoxy group which is not permuted [the heterocycle radical which is not permuted / the aryl group which is not permuted / the aralkyl radical which is not permuted / the alkyl group which is not permuted / a hydrogen atom, a halogen radical, a cyano group, a permutation,

or /, a permutation, or /, a permutation, or /, a permutation, or /, a permutation, or] or the permutation amino group, and even if the same, they may differ.

[0025]

[Formula 7]



[7]

[0026]

(You may differ, even if R13 comrades and R14 comrades which R13 and R14 express among a formula the aryl group which is not permuted [the aralkyl radical which is not permuted / the alkyl group which is not permuted / a hydrogen atom, a permutation or / a permutation, or /, a permutation, or], and are combined with a different fluorene radical may be the same and R13 and R14 which are combined with the same fluorene radical are the same.) The alkoxy group which is not permuted [the aralkyl radical which is not permuted / the alkyl group which is not permuted / R11, R12, **********, a permutation, or /, a permutation, or /, a permutation silyl radical, a cyano group, a permutation, or] is expressed, and even if the same, you may differ. Ar25 and Ar26 express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and even if the same, they may differ.

s shows the integer of 1-10.

[0027]

Moreover, in the organic light emitting device of this invention, it is desirable that the layer containing the compound shown by said general formula [1] is a luminous layer.

[Effect of the Invention]

[0028]

applied voltage with the organic light emitting device low as a monolayer or a mixing layer of a dopant/host using the compound shown by general formula [of this invention] [1] - [7] -- high -- brightness luminescence is obtained and it excels also in color purity and endurance. Furthermore, it can create using vacuum deposition or the casting method, and creation of a component is also comparatively cheap and can create the component of a large area easily.

[Best Mode of Carrying Out the Invention]

[0029]

Hereafter, this invention is explained to a detail.

[0030]

General formula [1] The compound shown by - [7] can mainly be used as a charge of organic light emitting device lumber. When using it as a charge of luminescence lumber also in it, the compound shown by general formula [1] - [7] can obtain high color purity, high luminous efficiency, and a high life component also in a monolayer, respectively. The compound shown by the general formula [1] takes the upright molecular structure by introducing an acetylenic group, and an emission spectrum with more narrow half-value width, i.e., luminescence which was more excellent in color purity, is obtained. furthermore, the thing suppressed for a Stokes shift -- migration of luminescence wavelength -- stopping -- absorption -- a long wave -- a merit side -- **** -- the case where coming is also possible and it uses as a dopant ingredient -- relative -- a long wave -- the activity of the host ingredient which has an emission spectrum in a merit side also becomes possible.

[0031]

General formula [1] The compound shown by - [7] is set to a luminous layer, respectively. Dopant ingredient, It can be

used for the object of both host ingredient, and high color purity, high luminous efficiency, and a high life component can be obtained. Use the compound shown by the general formula [1] especially as a dopant ingredient, and it and energy transfer with a combination with the compound shown by the suitable host ingredient, especially lifting and cone general formula [2] - [7] high -- color purity luminescence can be held and a component with more high effectiveness can be obtained. The dopant concentration to a host ingredient is 1 - 10% preferably 0.01% to 50%.

[0032]

The above-mentioned general formula [1] The example of the substituent in - [7] is shown below.

[0033]

As an alkyl group, a methyl group, an ethyl group, n-propyl group, an iso-propyl group, n-butyl, ter-butyl, an octyl radical, etc. are mentioned.

[0034]

Benzyl, a phenethyl radical, etc. are mentioned as an aralkyl radical.

[0035]

As an alkoxyl group, a methoxyl group, ethoxyl, propoxyl, a phenoxyl radical, etc. are mentioned.

[0036]

As an aryl group, a phenyl group, a biphenyl radical, a terphenyl radical, etc. are mentioned.

[0037]

As a heterocycle radical, a thienyl group, a pyrrolyl radical, a pyridyl radical, an oxazolyl radical, an oxadiazolyl radical, a thiazolyl radical, a thiadiazolyl radical, a TACHI enyl radical, etc. are mentioned.

[0038]

As a permutation amino group, a dimethylamino radical, a diethylamino radical, a dibenzylamino radical, a diphenylamino radical, a ditolylamino radical, the JIANISORIRU amino group, etc. are mentioned.

[0039]

A fluorine, chlorine, a bromine, iodine, etc. are mentioned as a halogen atom.

[0040]

As a condensed multi-ring aromatic series radical, a fluorenyl group, a naphthyl group, a fluoran thenyl radical, an anthryl radical, a phenan thrill radical, a pyrenyl radical, a tetra-SENIRU radical, a pen TASENIRU radical, etc. are mentioned.

[0041]

As a condensed multi-ring heterocycle radical, a quinolyl radical, a diaza fluorenyl group, an acridinyl radical, a phenan trolley nil radical, etc. are mentioned.

[0042]

As a substituent which the above-mentioned substituent may have, alkyl groups, such as a methyl group, an ethyl group, and a propyl group, Aryl groups, such as aralkyl radicals, such as benzyl and a phenethyl radical, a phenyl group, and a biphenyl radical, Heterocycle radicals, such as a thienyl group, a pyrrolyl radical, and a pyridyl radical, a dimethylamino radical, A diethylamino radical, a dibenzylamino radical, a diphenylamino radical, a ditolylamino radical, Halogen atoms, such as alkoxyl groups, such as amino groups, such as a JIANISORIRU amino group, a methoxyl group, ethoxyl, propoxyl, and a phenoxyl radical, a cyano group, a fluorine, chlorine, a bromine, and iodine, etc. are mentioned.

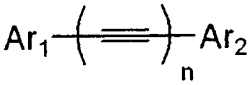
[0043]

Next, the example of representation is given about the compound shown by general formula [1] - [7]. However, it is not limited to these compounds.

[0044]

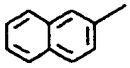
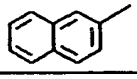
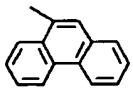
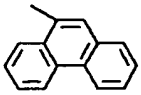
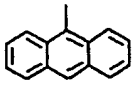
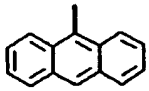
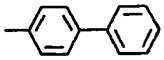
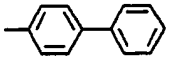
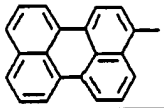
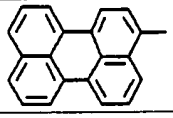
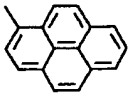
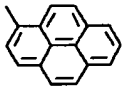
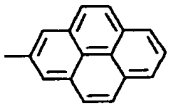
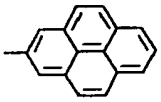
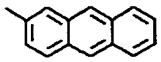
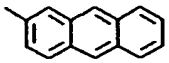
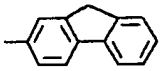
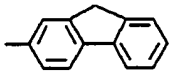
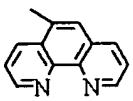
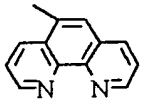
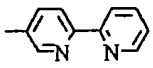
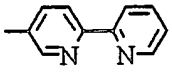
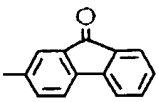
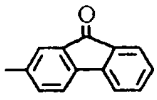
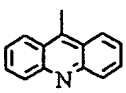
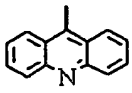
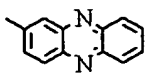
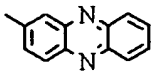
[Formula 8]

一般式[１]

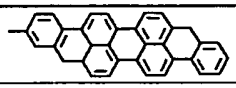
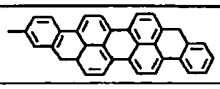
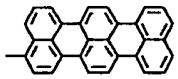
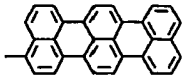
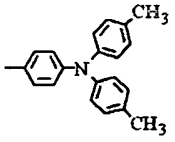
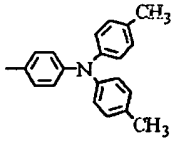
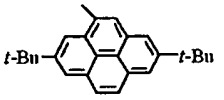
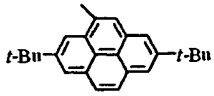
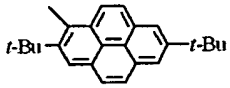
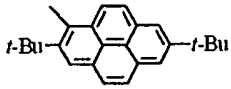
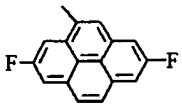
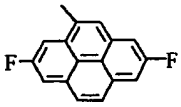
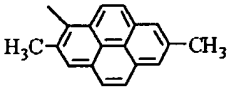
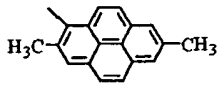
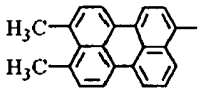
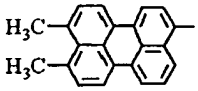
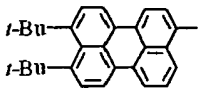
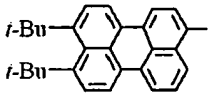
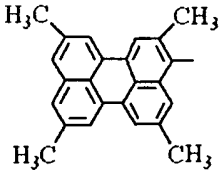
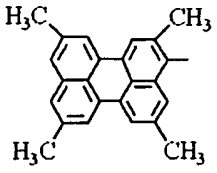
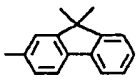
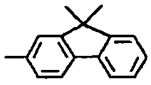
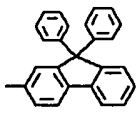
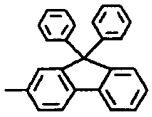
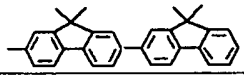
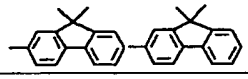
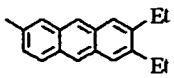
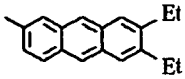
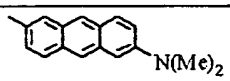
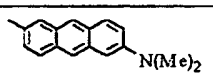


[1]

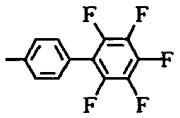
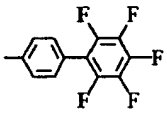
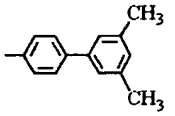
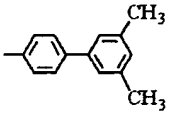
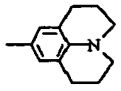
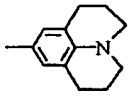
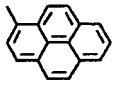
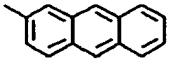
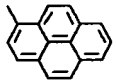
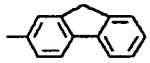
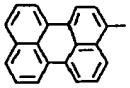
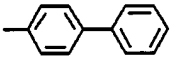
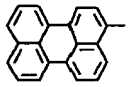
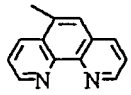
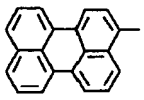
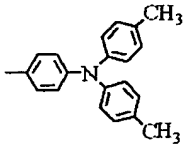
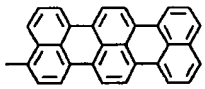
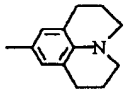
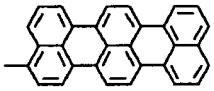
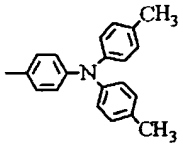
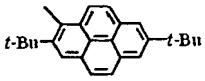
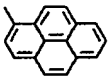
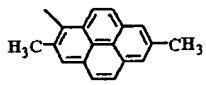
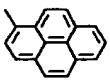
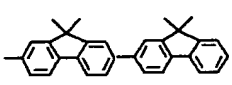
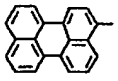
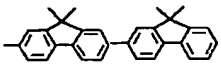
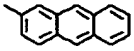
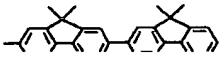
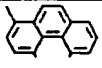
[0045]
[A table 1]

No	n	Ar1	Ar2
[1]-1	1		
[1]-2	1		
[1]-3	1		
[1]-4	1		
[1]-5	1		
[1]-6	1		
[1]-7	1		
[1]-8	1		
[1]-9	1		
[1]-10	1		
[1]-11	1		
[1]-12	1		
[1]-13	1		
[1]-14	1		
[1]-15	1		

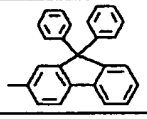
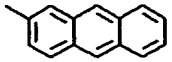
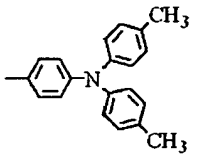
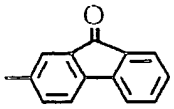
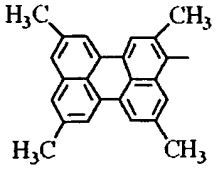
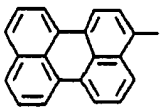
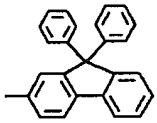
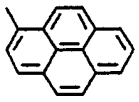
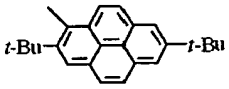
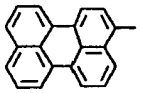
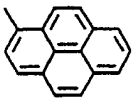
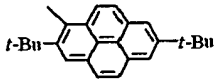
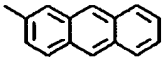
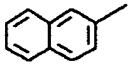
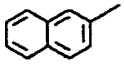
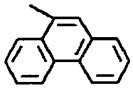
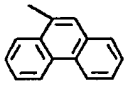
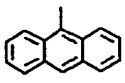
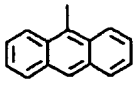
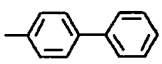
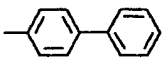
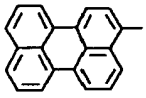
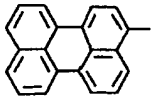
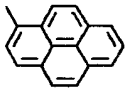
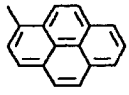
[0046]
[A table 2]

No	n	Ar1	Ar2
[1]－16	1		
[1]－17	1		
[1]－18	1		
[1]－19	1		
[1]－20	1		
[1]－21	1		
[1]－22	1		
[1]－23	1		
[1]－24	1		
[1]－25	1		
[1]－26	1		
[1]－27	1		
[1]－28	1		
[1]－29	1		
[1]－30	1		

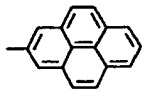
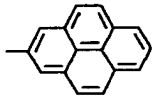
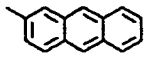
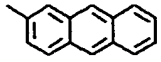
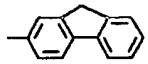
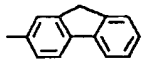
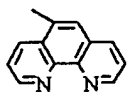
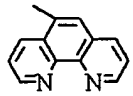
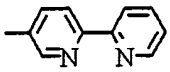
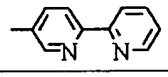
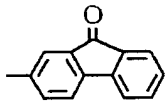
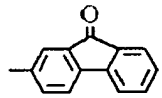
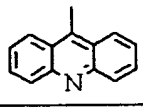
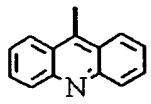
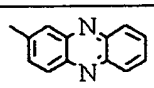
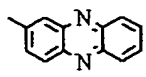
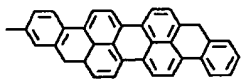
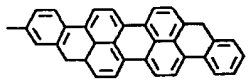
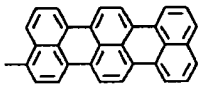
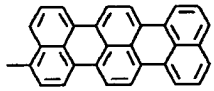
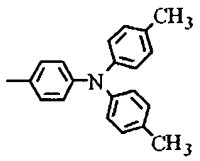
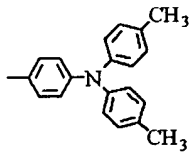
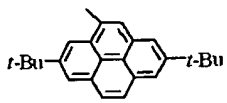
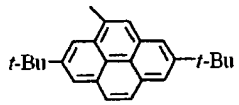
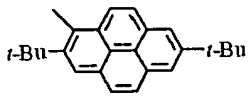
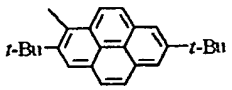
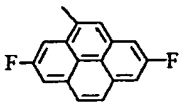
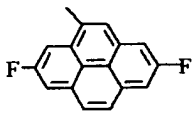
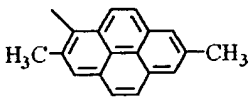
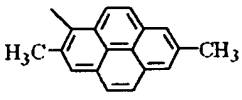
[0047]
[A table 3]

No	n	Ar1	Ar2
[1]−31	1		
[1]−32	1		
[1]−33	1		
[1]−34	1		
[1]−35	1		
[1]−36	1		
[1]−37	1		
[1]−38	1		
[1]−39	1		
[1]−40	1		
[1]−41	1		
[1]−42	1		
[1]−43	1		
[1]−44	1		
[1]−45	1		

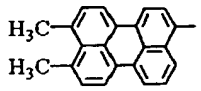
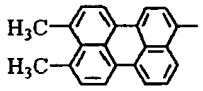
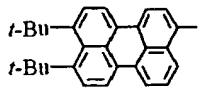
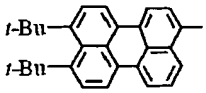
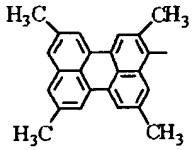
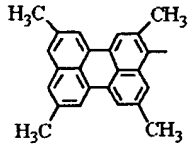
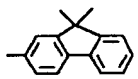
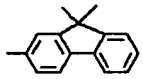
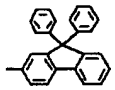
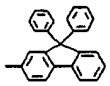
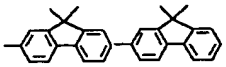
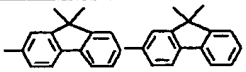
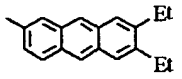
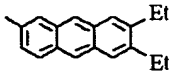
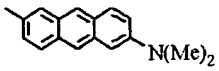
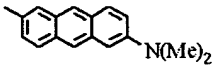
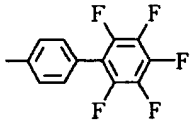
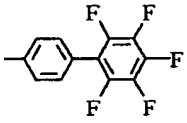
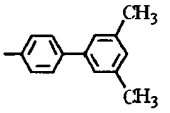
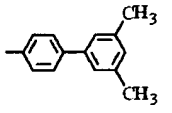
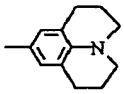
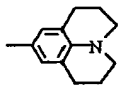
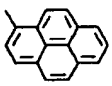
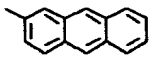
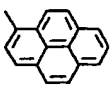
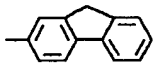
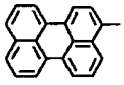
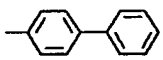
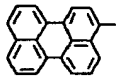
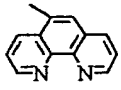
[0048]
[A table 4]

No	n	Ar1	Ar2
[1]−46	1		
[1]−47	1		
[1]−48	1		
[1]−49	1		
[1]−50	1		
[1]−51	1		t−Bu
[1]−52	1		$N(Me)_2$
[1]−53	1		CN
[1]−54	2		
[1]−55	2		
[1]−56	2		
[1]−57	2		
[1]−58	2		
[1]−59	2		
[1]−60	2		

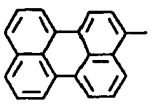
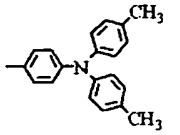
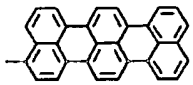
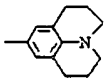
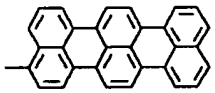
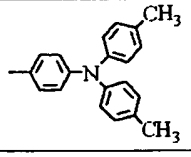
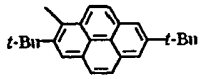
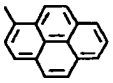
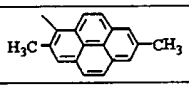
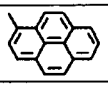
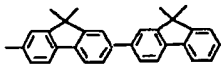
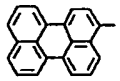
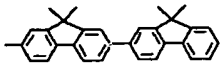
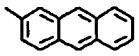
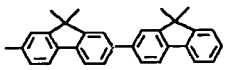
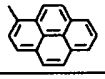
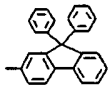
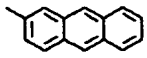
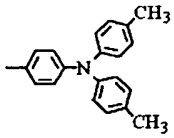
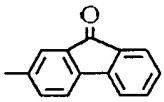
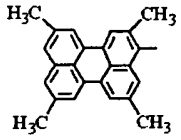
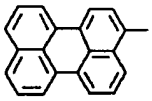
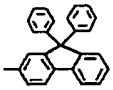
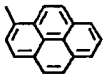
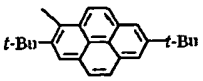
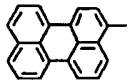
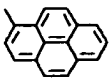
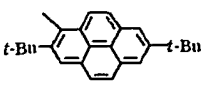
[0049]
[A table 5]

No	n	Ar1	Ar2
[1]−61	2		
[1]−62	2		
[1]−63	2		
[1]−64	2		
[1]−65	2		
[1]−66	2		
[1]−67	2		
[1]−68	2		
[1]−69	2		
[1]−70	2		
[1]−71	2		
[1]−72	2		
[1]−73	2		
[1]−74	2		
[1]−75	2		

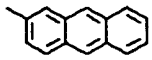
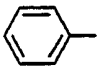
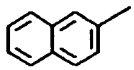
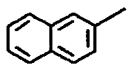
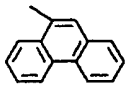
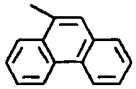
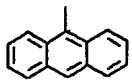
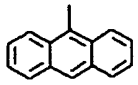
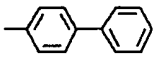
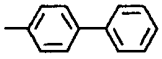
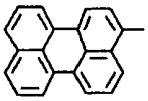
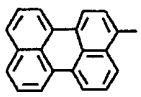
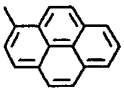
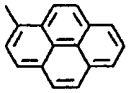
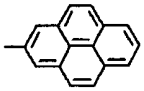
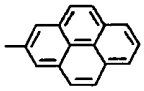
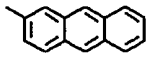
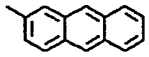
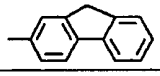
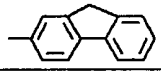
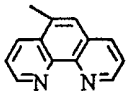
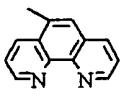
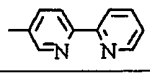
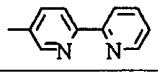
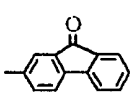
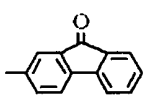
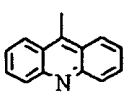
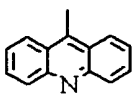
[0050]
[A table 6]

No	n	Ar1	Ar2
[1]−76	2		
[1]−77	2		
[1]−78	2		
[1]−79	2		
[1]−80	2		
[1]−81	2		
[1]−82	2		
[1]−83	2		
[1]−84	2		
[1]−85	2		
[1]−86	2		
[1]−87	2		
[1]−88	2		
[1]−89	2		
[1]−90	2		

[0051]
[A table 7]

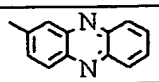
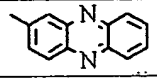
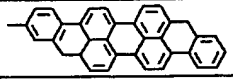
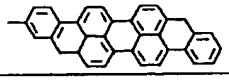
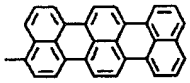
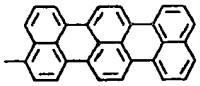
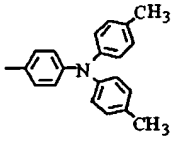
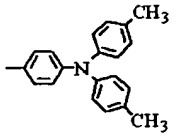
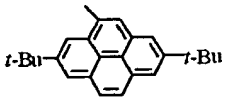
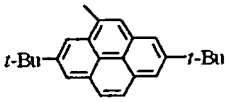
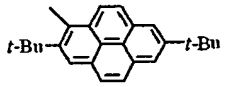
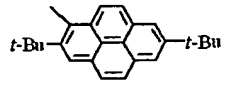
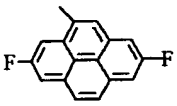
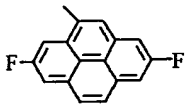
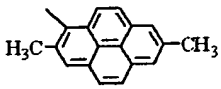
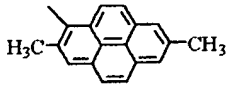
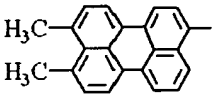
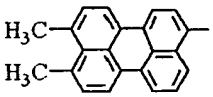
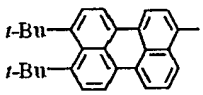
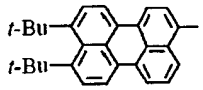
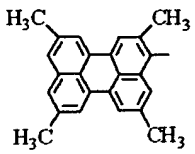
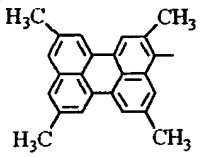
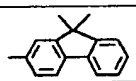
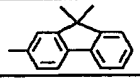
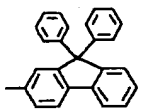
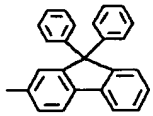
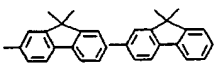
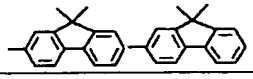
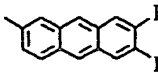
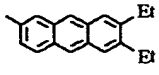
No	n	Ar1	Ar2
[1]−91	2		
[1]−92	2		
[1]−93	2		
[1]−94	2		
[1]−95	2		
[1]−96	2		
[1]−97	2		
[1]−98	2		
[1]−99	2		
[1]−100	2		
[1]−101	2		
[1]−102	2		
[1]−103	2		
[1]−104	2		t−Bu
[1]−105	2		N(Me)$_2$

[0052]
[A table 8]

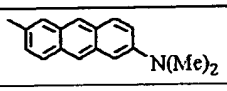
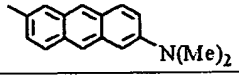
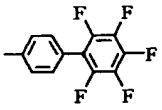
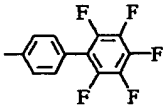
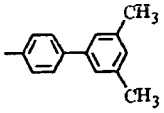
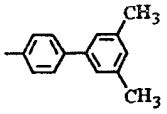
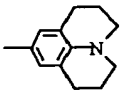
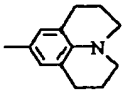
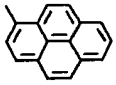
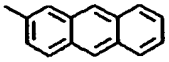
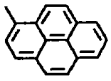
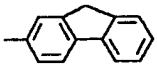
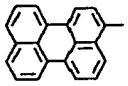
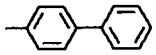
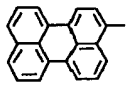
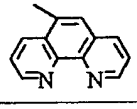
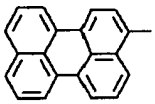
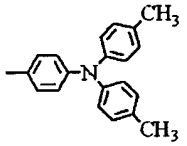
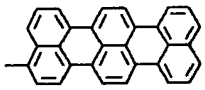
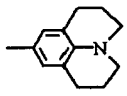
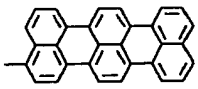
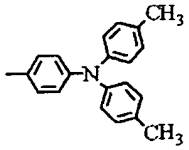
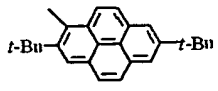
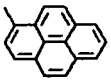
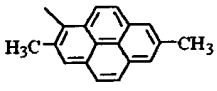
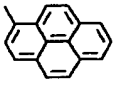
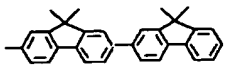
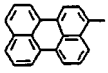
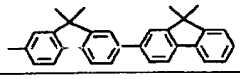
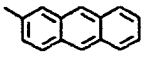
No	n	Ar1	Ar2
[1]－106	2		CN
[1]－107	3		
[1]－108	3		
[1]－109	3		
[1]－110	3		
[1]－111	3		
[1]－112	3		
[1]－113	3		
[1]－114	3		
[1]－115	3		
[1]－116	3		
[1]－117	3		
[1]－118	3		
[1]－119	3		
[1]－120	3		

[0053]

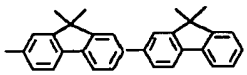
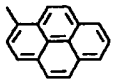
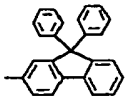
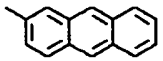
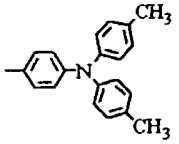
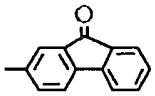
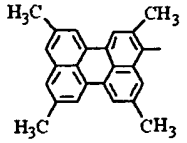
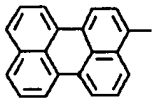
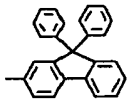
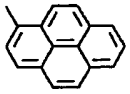
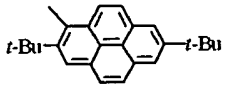
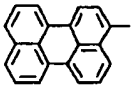
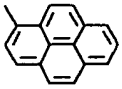
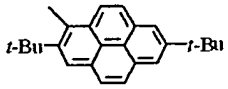
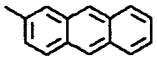
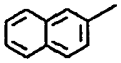
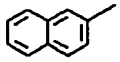
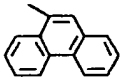
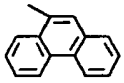
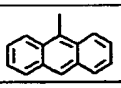
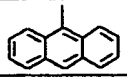
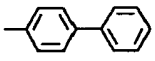
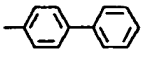
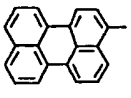
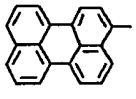
[A table 9]

No	n	Ar1	Ar2
[1]－121	3		
[1]－122	3		
[1]－123	3		
[1]－124	3		
[1]－125	3		
[1]－126	3		
[1]－127	3		
[1]－128	3		
[1]－129	3		
[1]－130	3		
[1]－131	3		
[1]－132	3		
[1]－133	3		
[1]－134	3		
[1]－135	3		

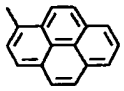
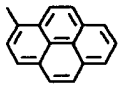
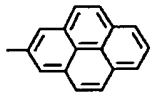
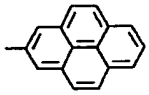
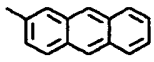
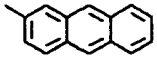
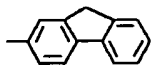
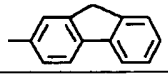
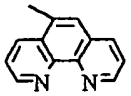
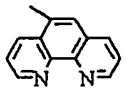
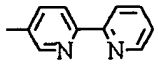
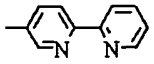
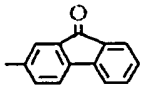
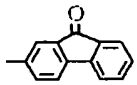
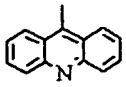
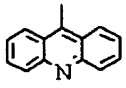
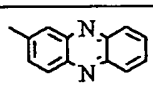
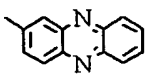
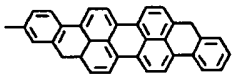
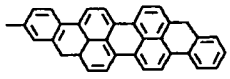
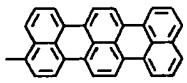
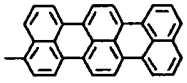
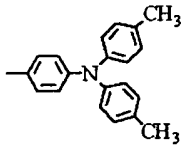
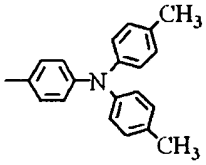
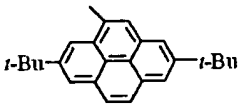
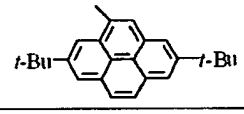
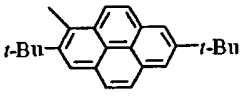
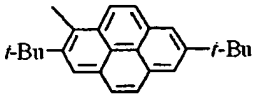
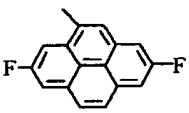
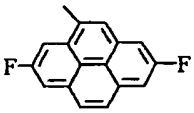
[0054]
[A table 10]

No	n	Ar1	Ar2
[1]－136	3		
[1]－137	3		
[1]－138	3		
[1]－139	3		
[1]－140	3		
[1]－141	3		
[1]－142	3		
[1]－143	3		
[1]－144	3		
[1]－145	3		
[1]－146	3		
[1]－147	3		
[1]－148	3		
[1]－149	3		
[1]－150	3		

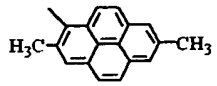
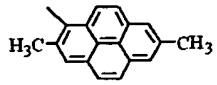
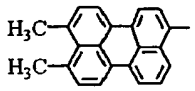
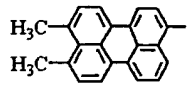
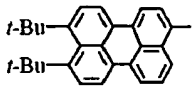
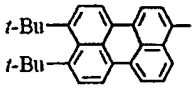
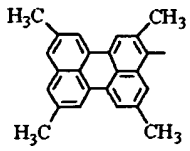
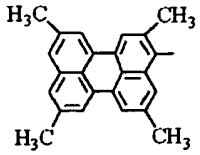
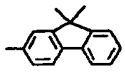
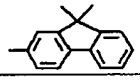
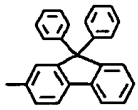
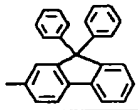
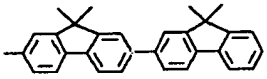
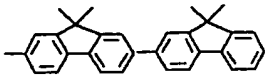
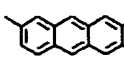
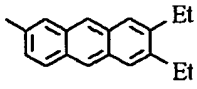
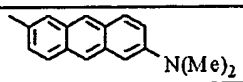
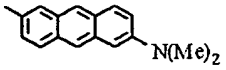
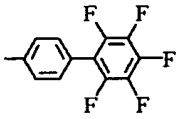
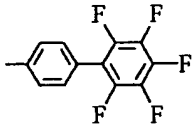
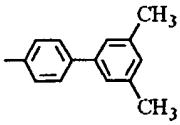
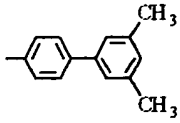
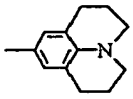
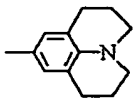
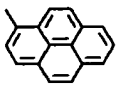
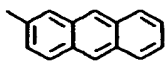
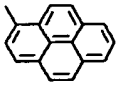
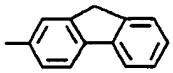
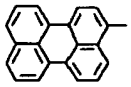
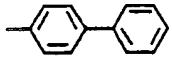
[0055]
[A table 11]

No	n	Ar1	Ar2
[1]－151	3		
[1]－152	3		
[1]－153	3		
[1]－154	3		
[1]－155	3		
[1]－156	3		
[1]－157	3		t－Bu
[1]－158	3		$N(Me)_2$
[1]－159	3		CN
[1]－160	4		
[1]－161	4		
[1]－162	4		
[1]－163	4		
[1]－164	4		
[1]－165	4		

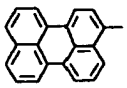
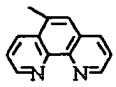
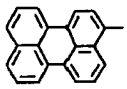
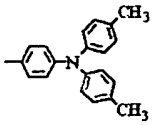
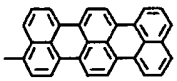
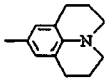
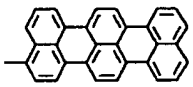
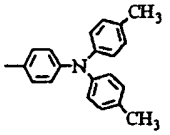
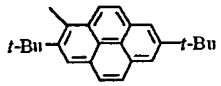
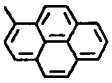
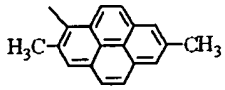
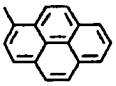
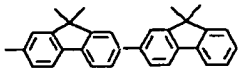
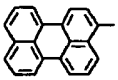
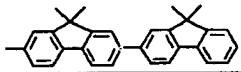
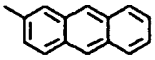
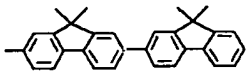
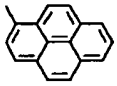
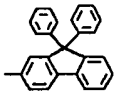
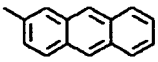
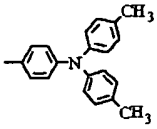
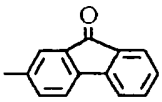
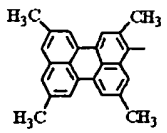
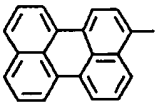
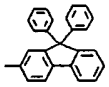
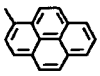
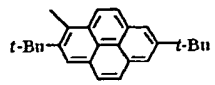
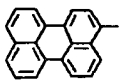
[0056]
[A table 12]

No	n	Ar1	Ar2
[1]−166	4		
[1]−167	4		
[1]−168	4		
[1]−169	4		
[1]−170	4		
[1]−171	4		
[1]−172	4		
[1]−173	4		
[1]−174	4		
[1]−175	4		
[1]−176	4		
[1]−177	4		
[1]−178	4		
[1]−179	4		
[1]−180	4		

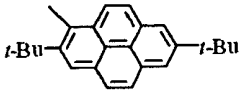
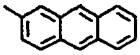
[0057]
[A table 13]

No	n	Ar1	Ar2
[1]−181	4		
[1]−182	4		
[1]−183	4		
[1]−184	4		
[1]−185	4		
[1]−186	4		
[1]−187	4		
[1]−188	4		
[1]−189	4		
[1]−190	4		
[1]−191	4		
[1]−192	4		
[1]−193	4		
[1]−194	4		
[1]−195	4		

[0058]
[A table 14]

No	n	Ar1	Ar2
[1]－196	4		
[1]－197	4		
[1]－198	4		
[1]－199	4		
[1]－200	4		
[1]－201	4		
[1]－202	4		
[1]－203	4		
[1]－204	4		
[1]－205	4		
[1]－206	4		
[1]－207	4		
[1]－208	4		
[1]－209	4		
			

[0059]
[A table 15]

No	n	Ar1	Ar2
[1]−211	4		
[1]−212	4		
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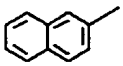
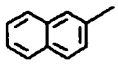
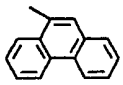
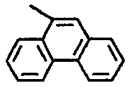
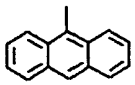
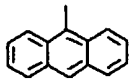
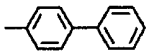
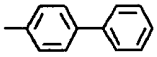
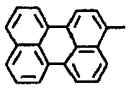
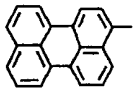
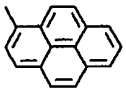
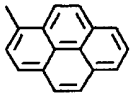
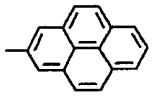
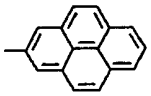
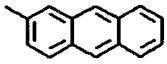
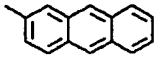
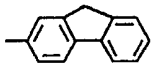
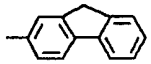
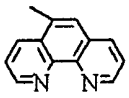
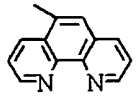
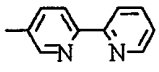
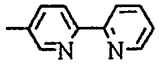
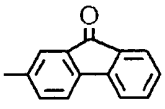
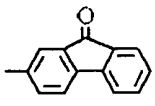
[1]−214	5		
[1]−215	5		
[1]−216	5		
[1]−217	5		
[1]−218	5		
[1]−219	5		
[1]−220	5		
[1]−221	5		
[1]−222	5		
[1]−223	5		
[1]−224	5		
[1]−225	5		

[0060]

[A table 16]

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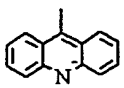
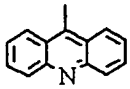
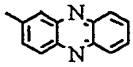
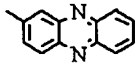
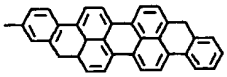
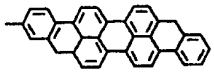
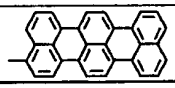
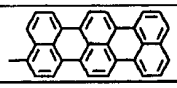
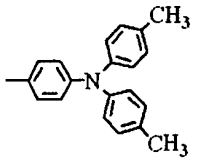
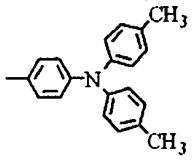
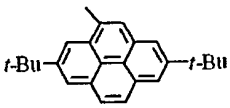
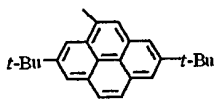
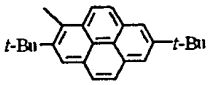
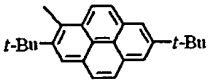
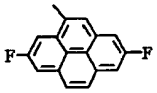
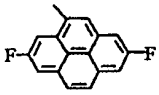
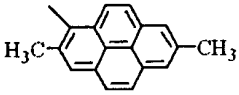
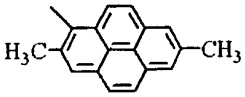
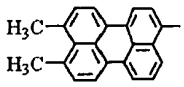
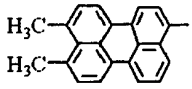
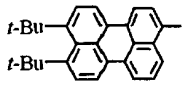
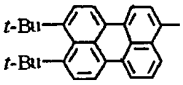
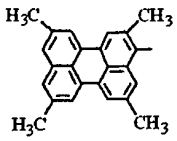
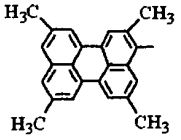
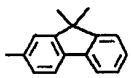
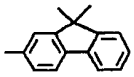
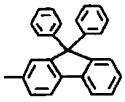
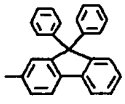
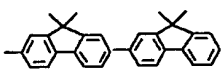
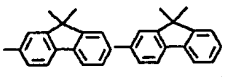
[1]−226	5		
[1]−227	5		
[1]−228	5		
[1]−229	5		
[1]−230	5		
[1]−231	5		
[1]−232	5		
[1]−233	5		
[1]−234	5		
[1]−235	5		
[1]−236	5		
[1]−237	5		
[1]−238	5		
[1]−239	5		
[1]−240	5		

[0061]
[A table 17]

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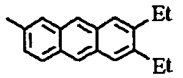
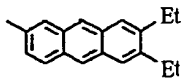
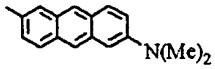
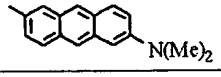
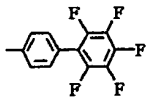
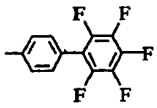
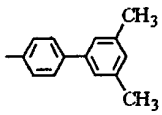
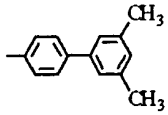
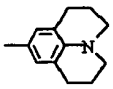
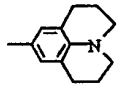
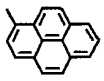
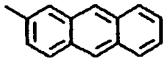
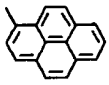
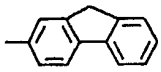
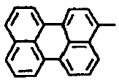
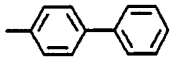
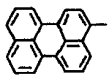
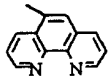
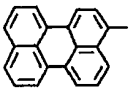
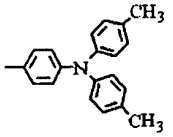
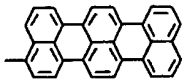
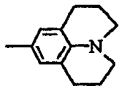
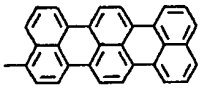
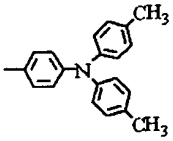
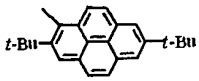
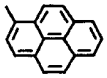
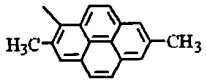
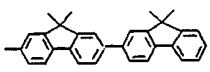
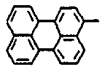
[1]−241	5		
[1]−242	5		
[1]−243	5		
[1]−244	5		
[1]−245	5		
[1]−246	5		
[1]−247	5		
[1]−248	5		
[1]−249	5		
[1]−250	5		
[1]−251	5		
[1]−252	5		
[1]−253	5		
[1]−254	5		
[1]−255	5		

[0062]
[A table 18]

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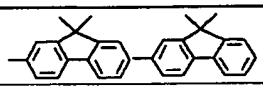
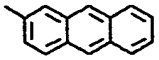
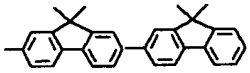
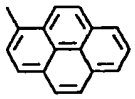
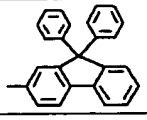
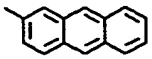
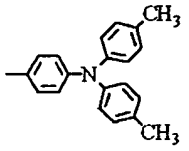
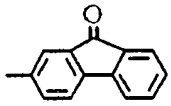
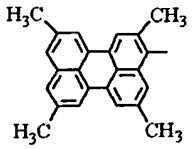
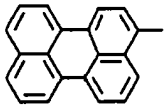
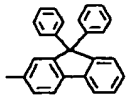
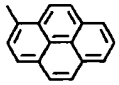
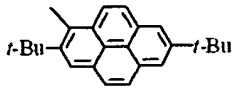
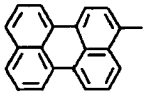
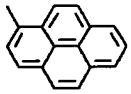
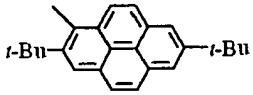
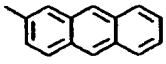
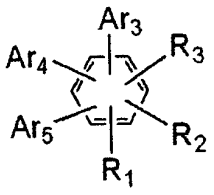
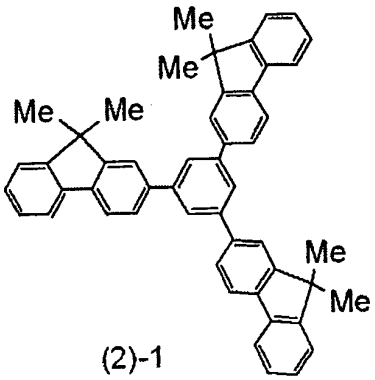
[1]−256	5		
[1]−257	5		
[1]−258	5		
[1]−259	5		
[1]−260	5		
[1]−261	5		
[1]−262	5		
[1]−263	5		t−Bu
[1]−264	5		$N(Me)_2$
[1]−265	5		CN

[0063]
[Formula 9]

一般式[２]





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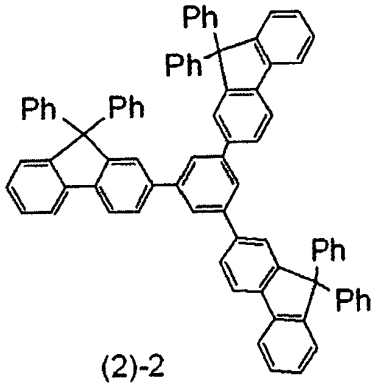
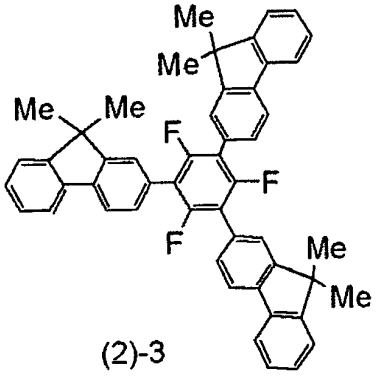
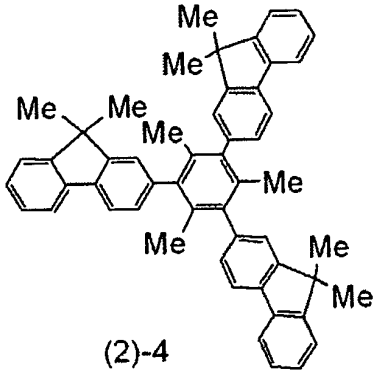


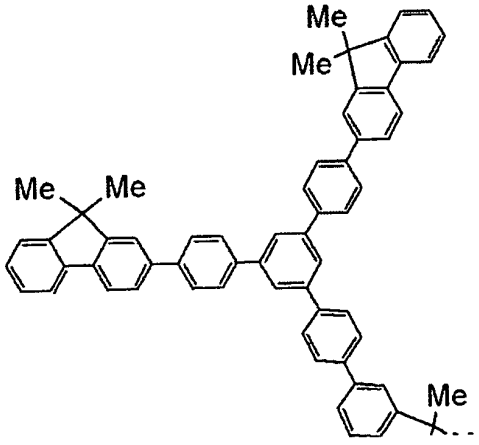
(2)-2

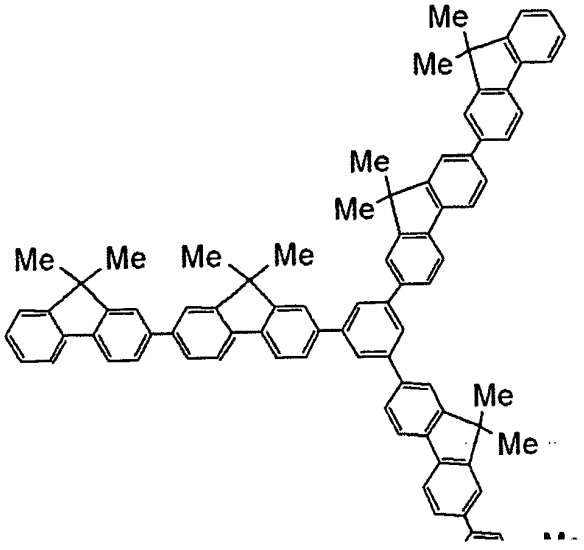


(2)-3

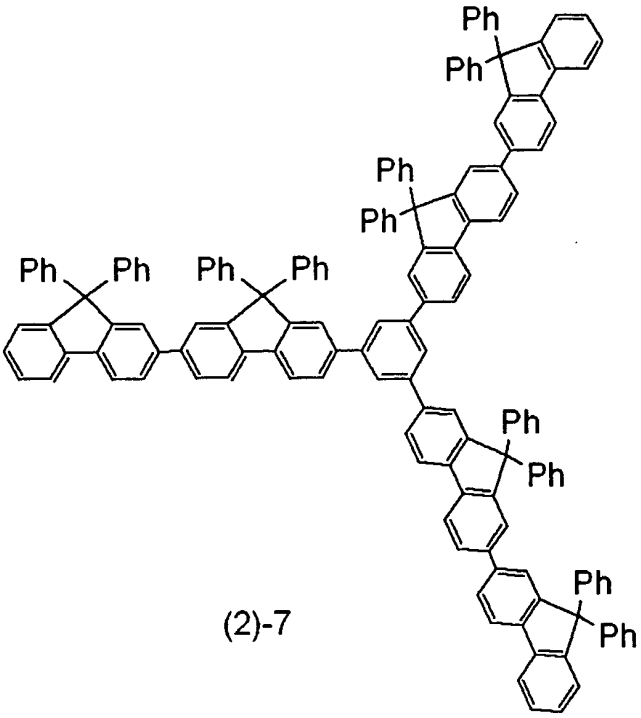


(2)-4





[0064]
[Formula 10]



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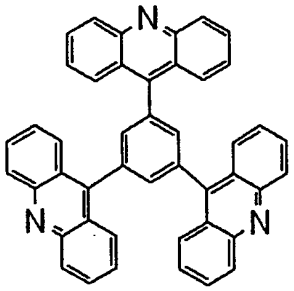
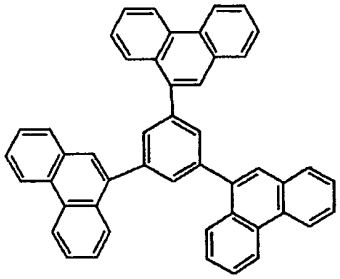
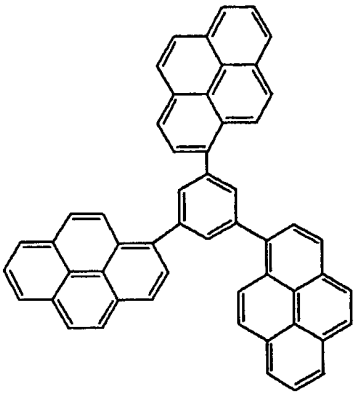


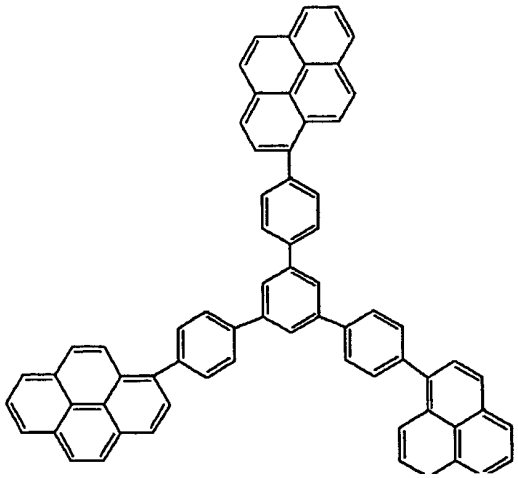
(2)-8

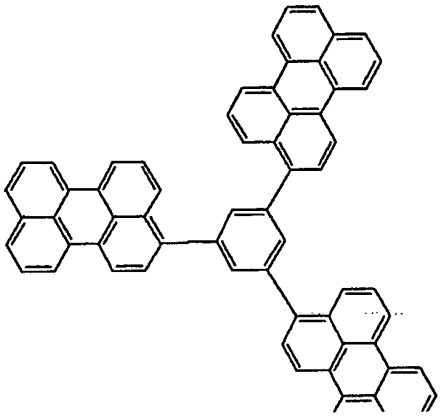


(2)-9

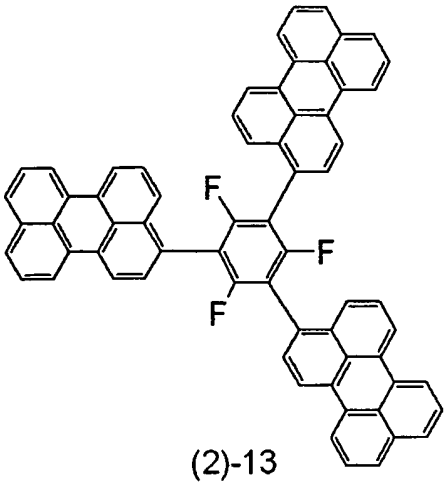


(2)-10

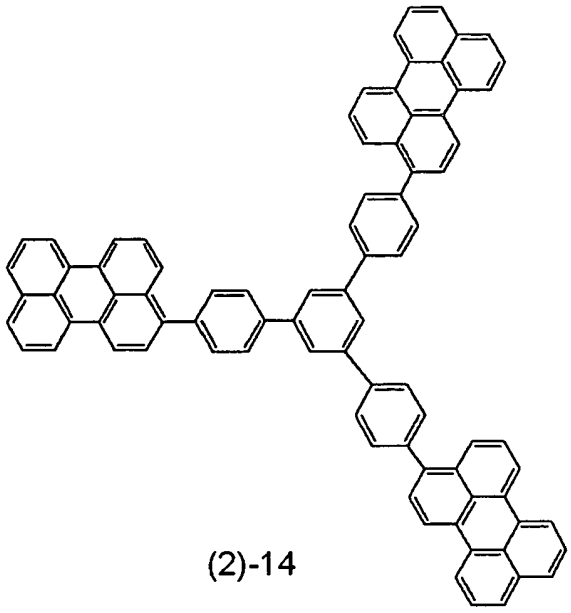




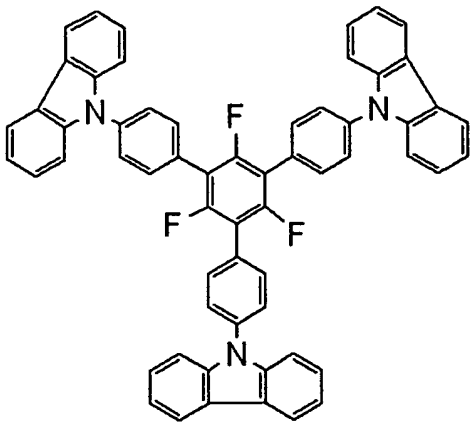
[0065]
[Formula 11]



(2)-13



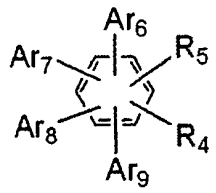
(2)-14

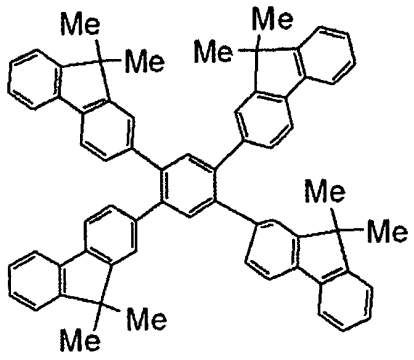


(2)-15

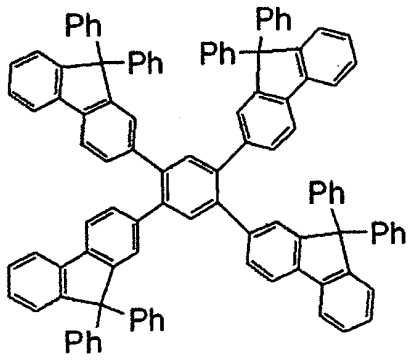
[0066]
[Formula 12]

一般式[３]





(3)-1



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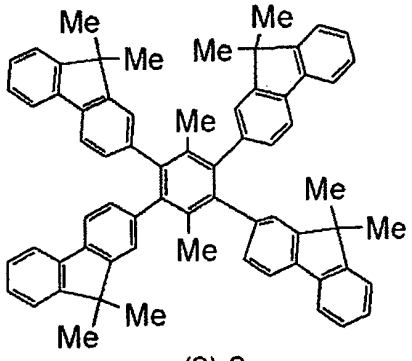
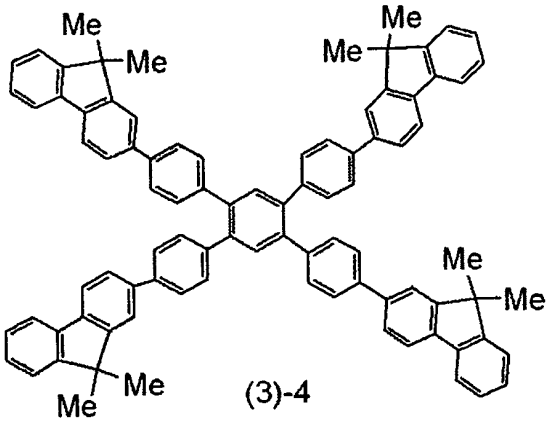
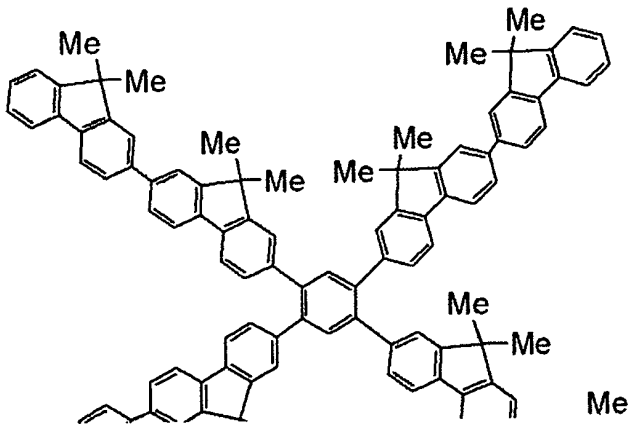


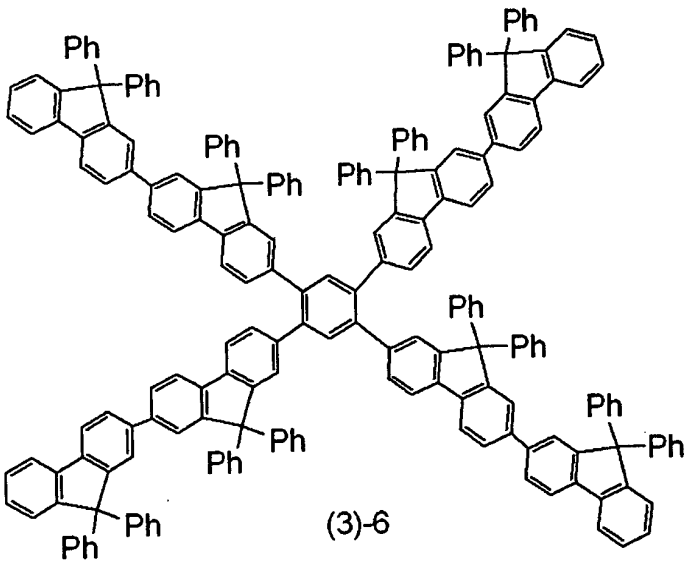
(3)-3



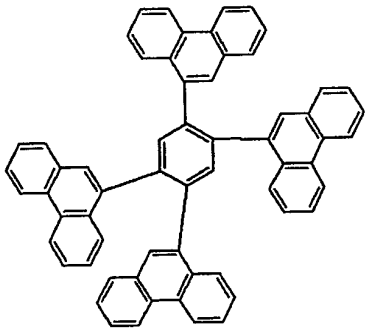
(3)-4



[0067]
[Formula 13]



(3)-6



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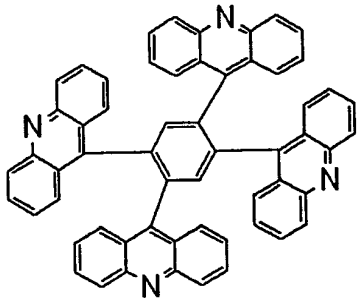
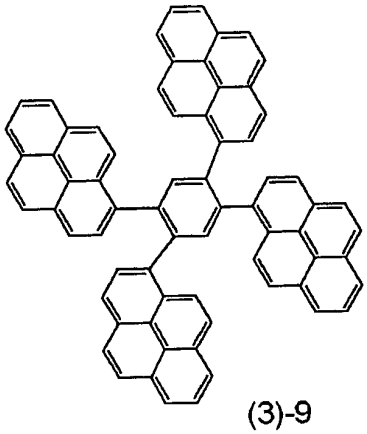
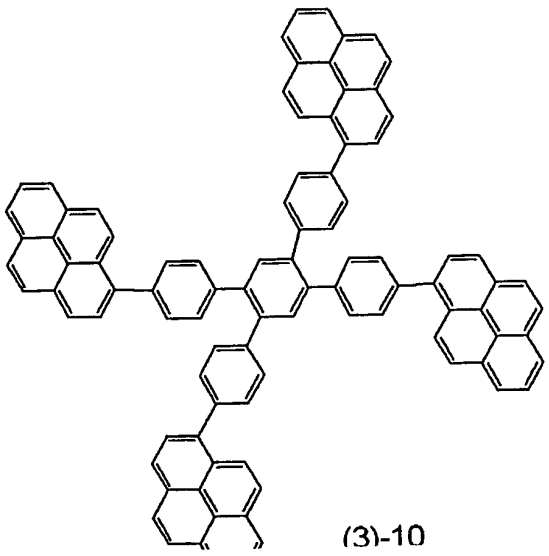


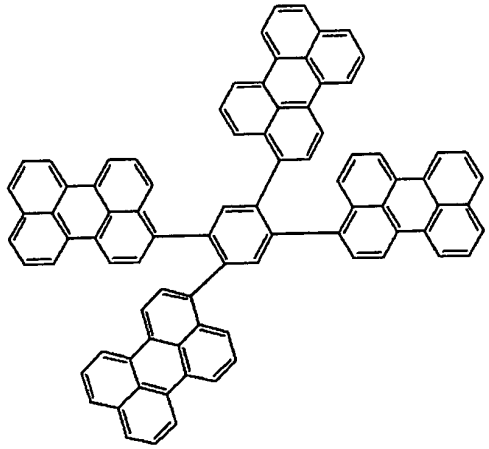
(3)-8



(3)-9

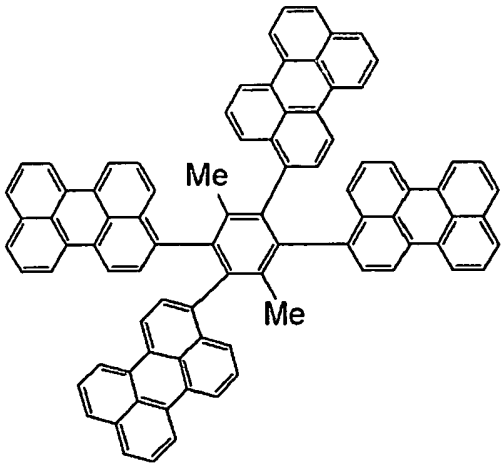


(3)-10

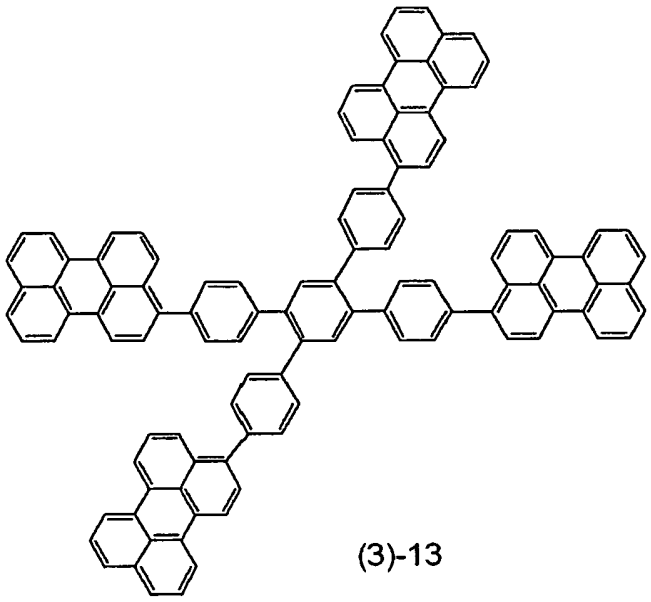


(3)-11

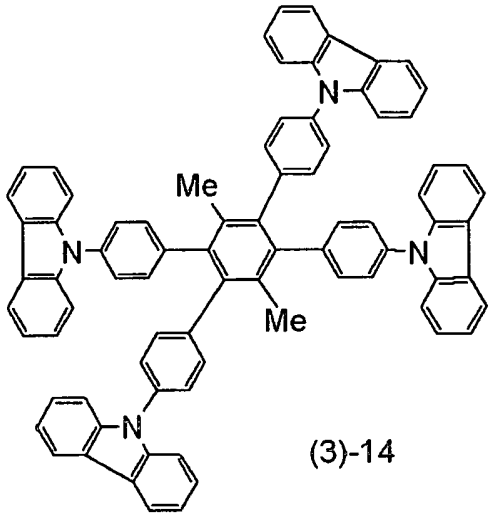
[0068]
[Formula 14]



(3)-12



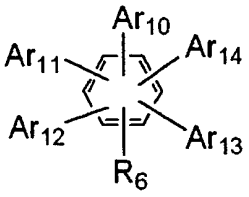
(3)-13



(3)-14

[0069]
[Formula 15]

一般式[４]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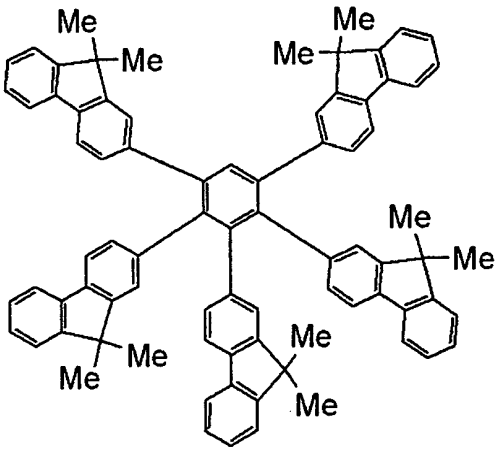
Ar14
Ar12
Ar13
R6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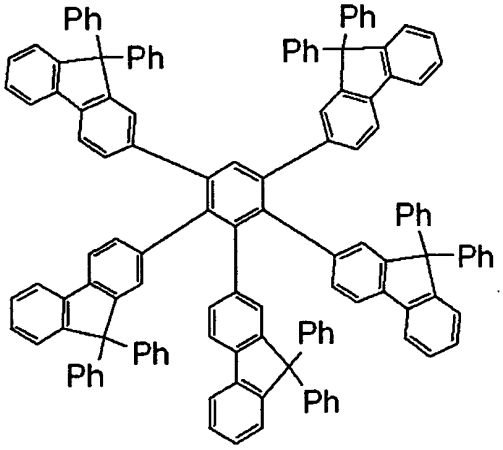
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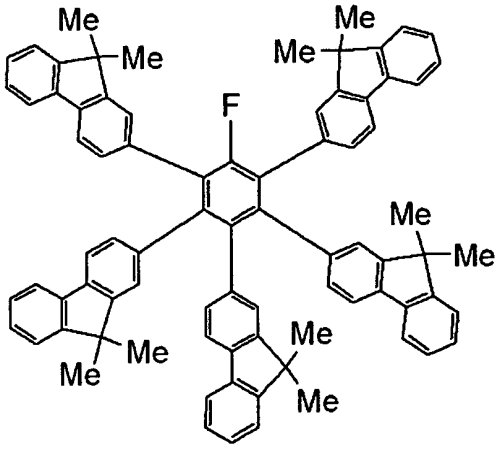
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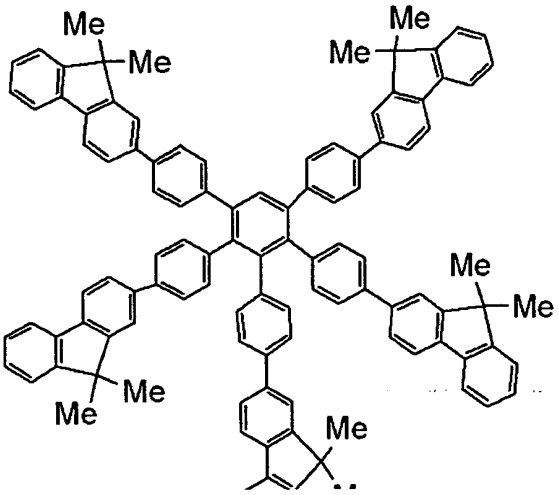
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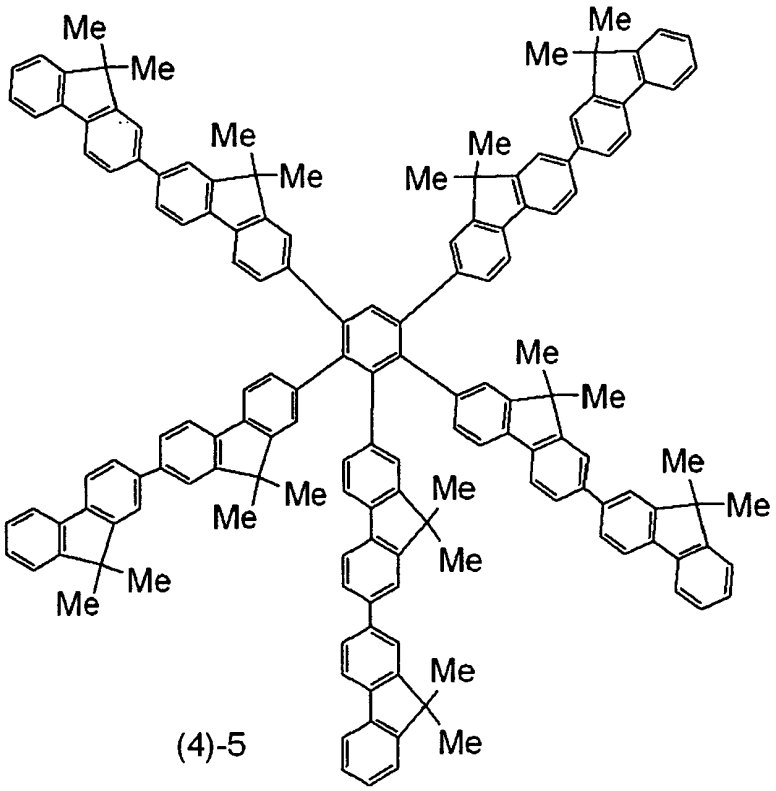
[0070]
[Formula 16]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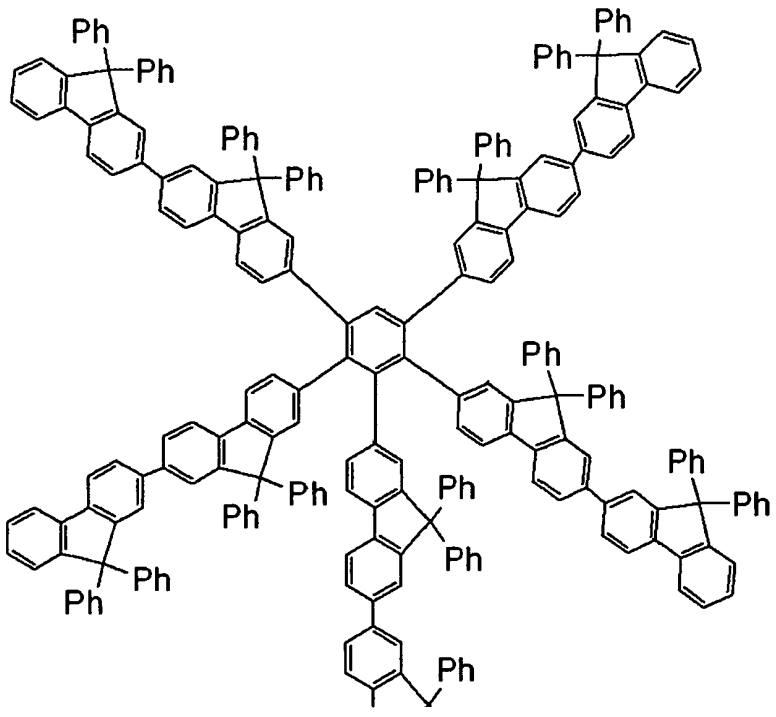
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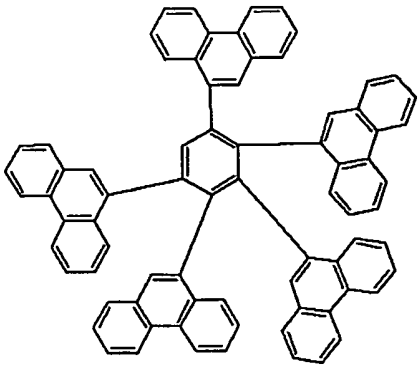
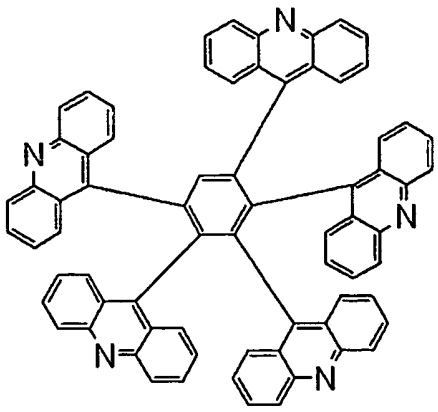
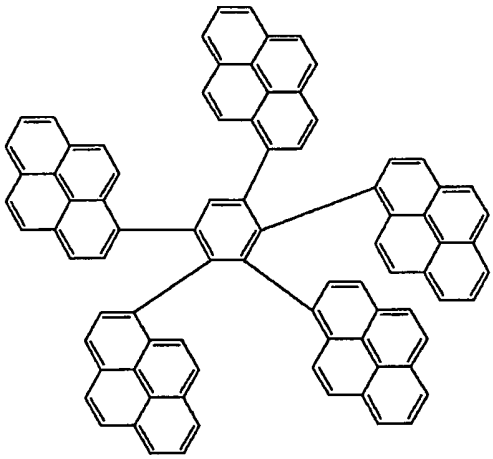
[0071]
[Formula 17]



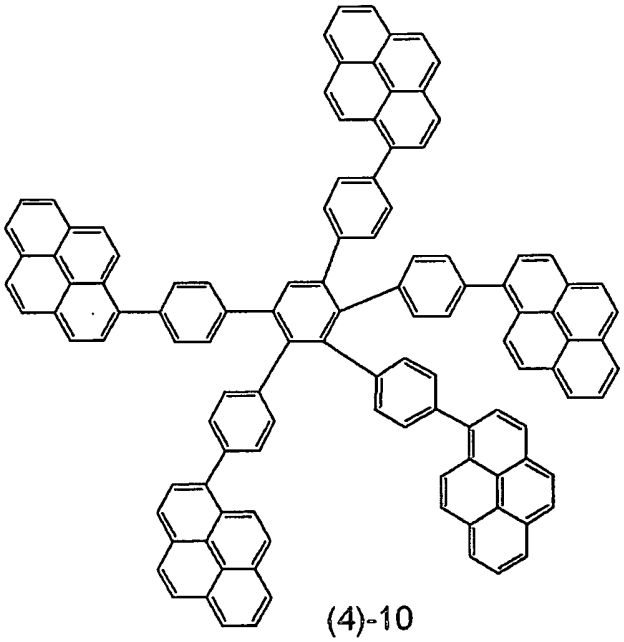
(4)-7



(4)-8

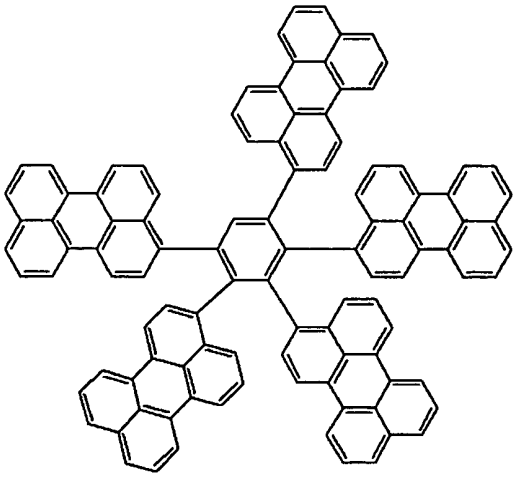


(4)-9

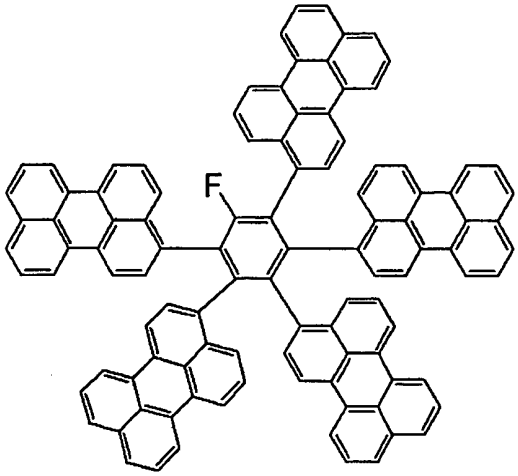


(4)-10

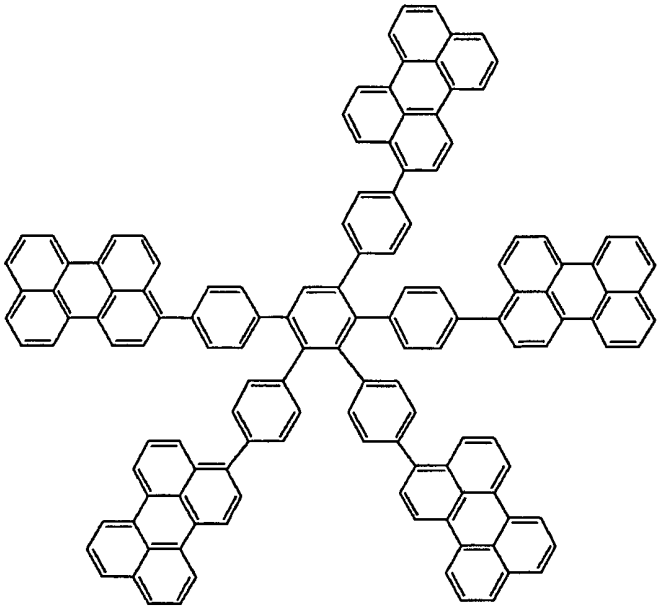
[0072]
[Formula 18]



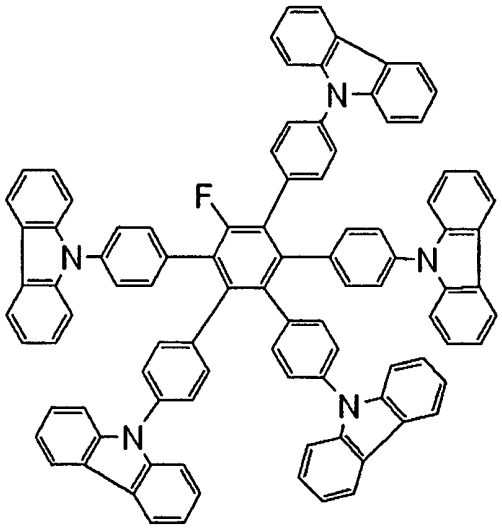
(4)-11



(4)-12



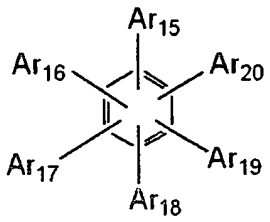
(4)-13

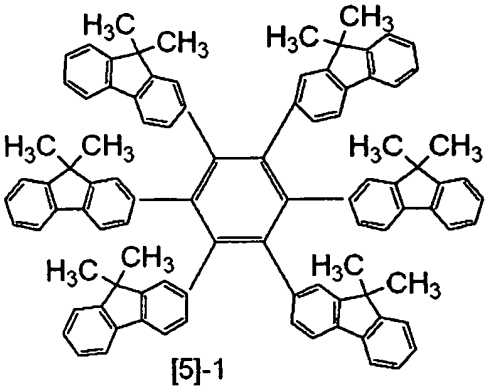


(4)-14

[0073]
[Formula 19]

一般式[５]





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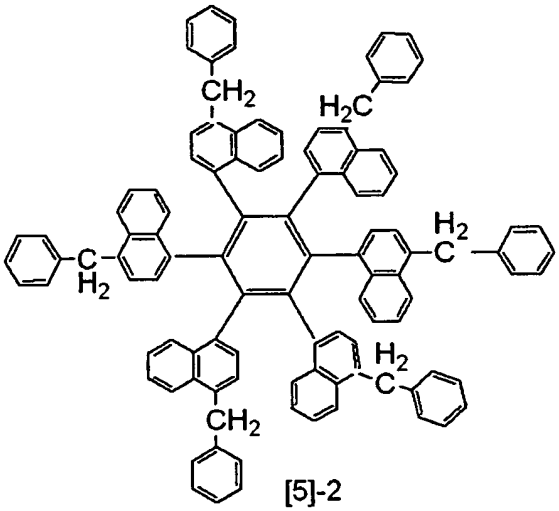
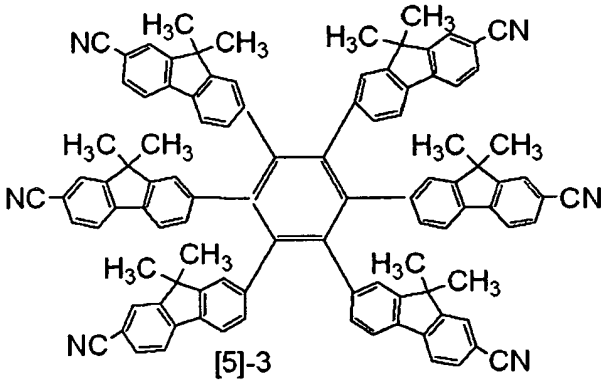


[5]-2



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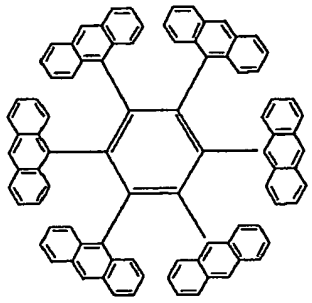
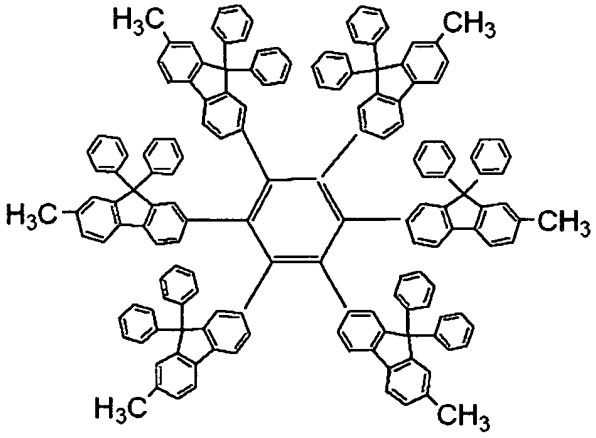


[5]-4



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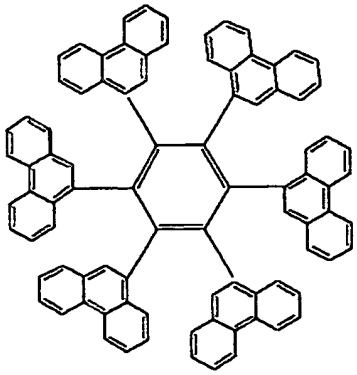
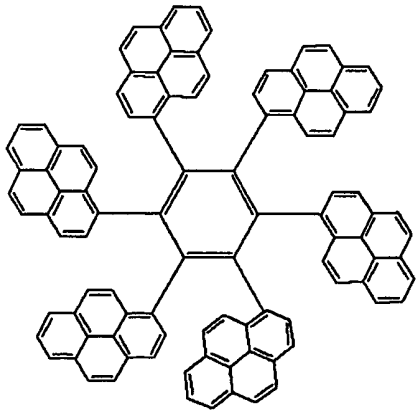


[5]-6

[0074]
[Formula 20]



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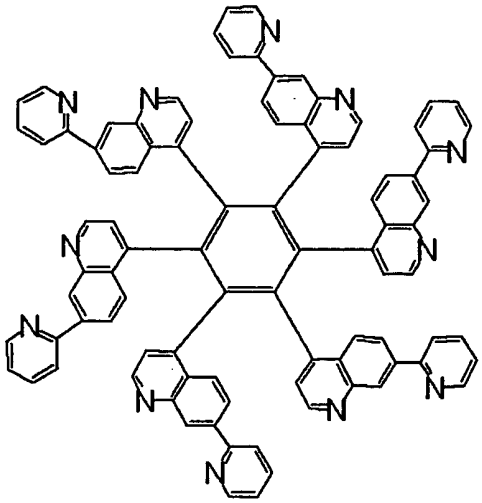

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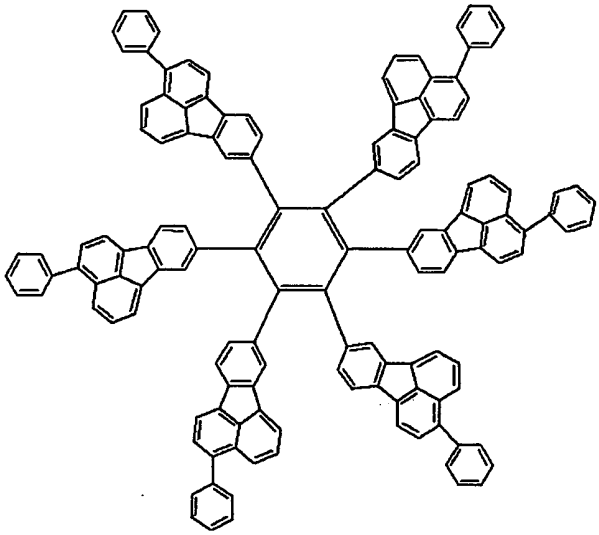

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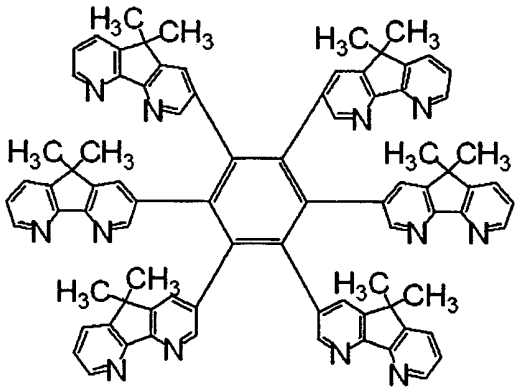

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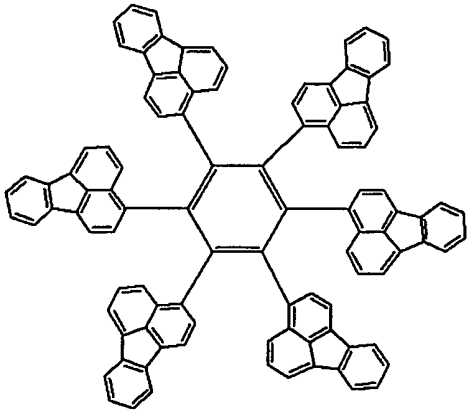

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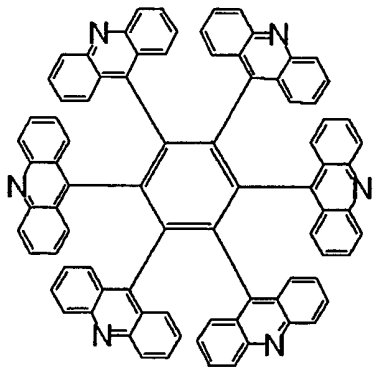
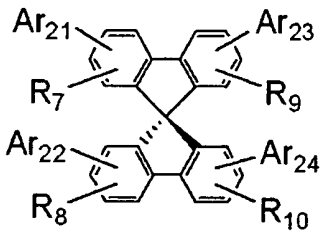


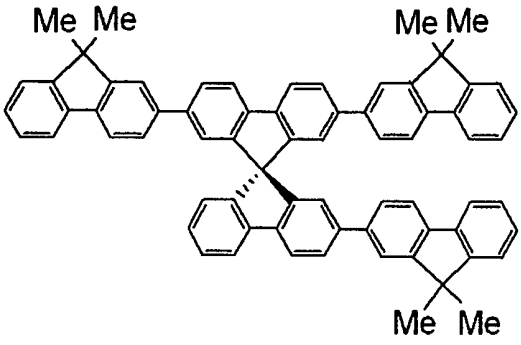
[5]-12

[0075]

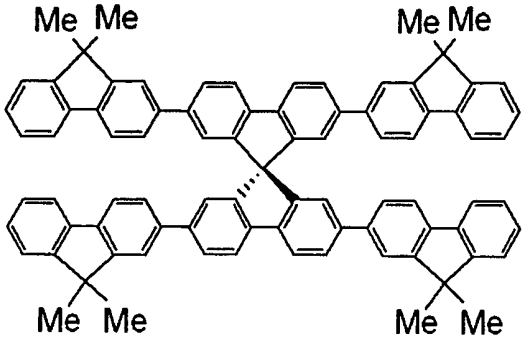
[Formula 21]

一般式[６]

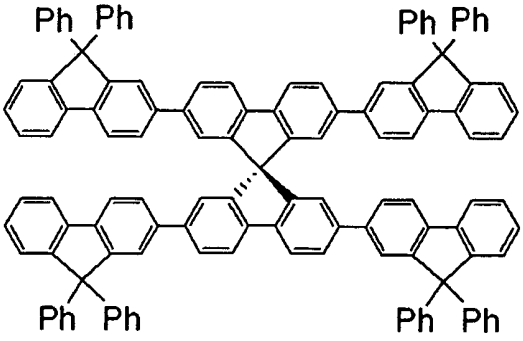




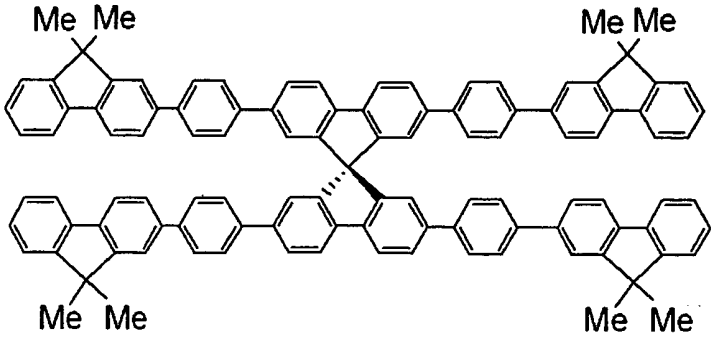
(6)-1



(6)-2

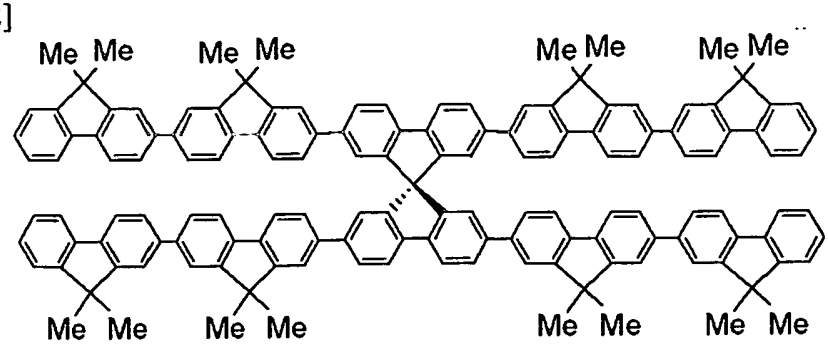


(6)-3

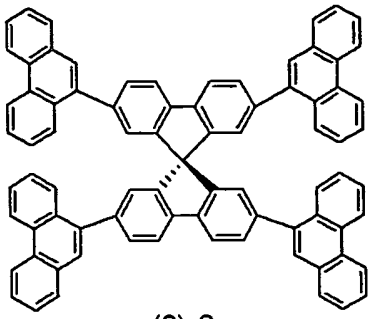


(6)-4

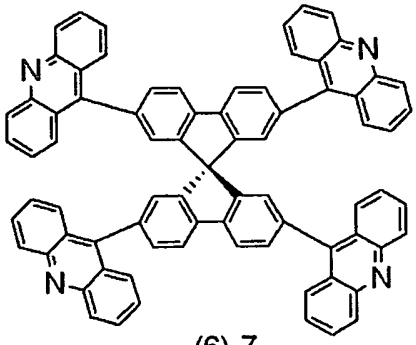
[0076]
[Formula 22]



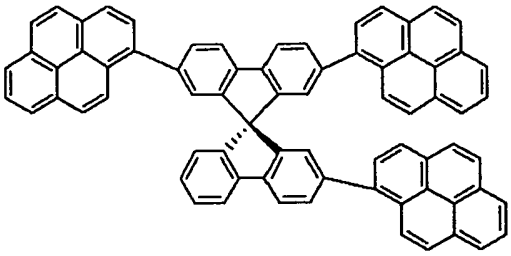
(6)-5



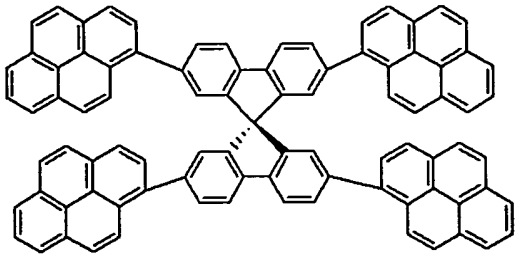
(6)-6



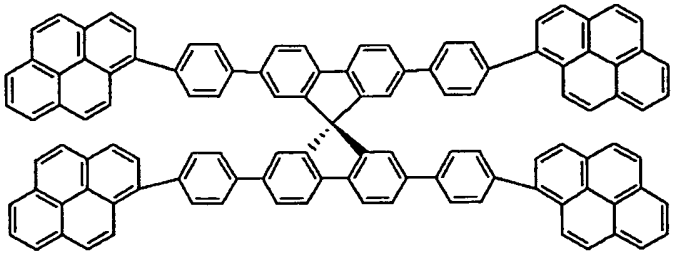
(6)-7



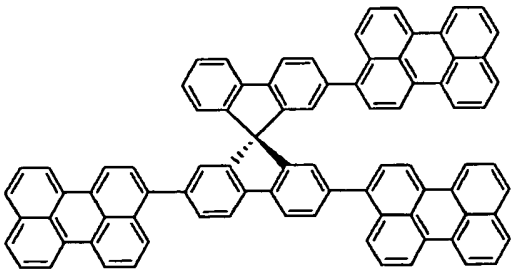
(6)-8



(6)-9

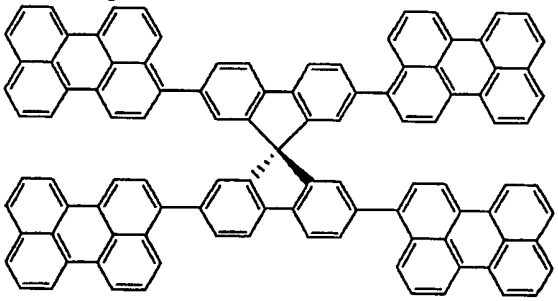


(6)-10

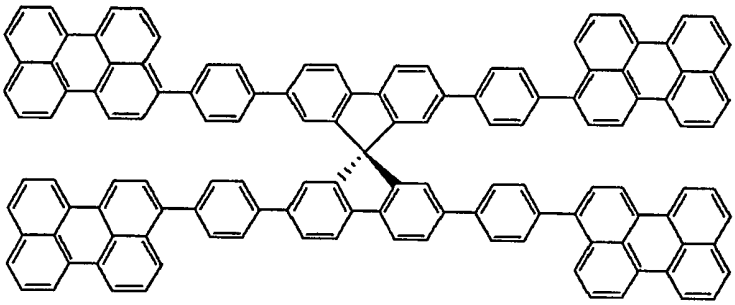


(6)-11

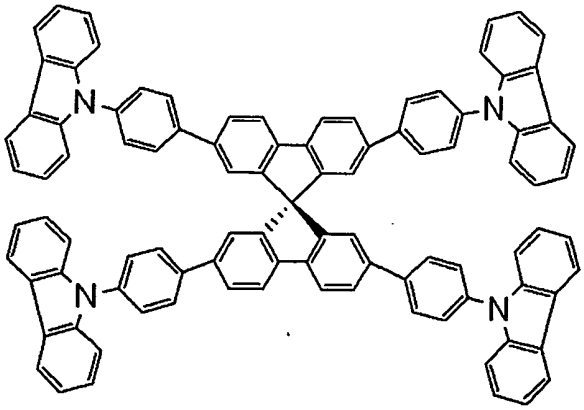
[0077]
[Formula 23]



(6)-12



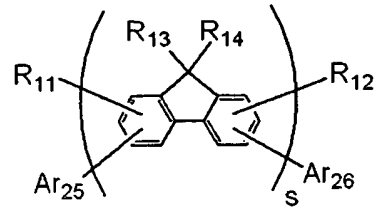
(6)-13

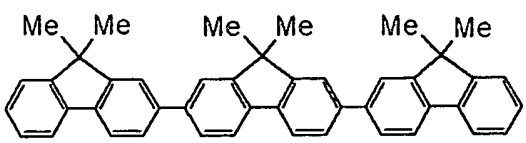


(6)-14

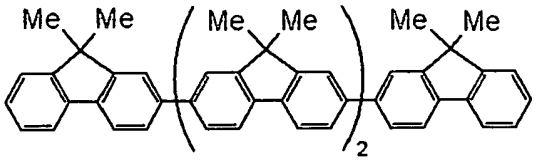
[0078]
[Formula 24]

一般式[7]

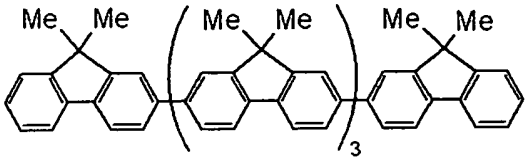




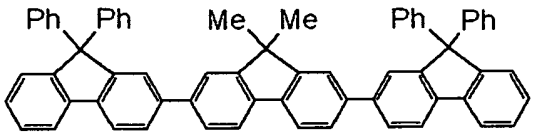
[7]-1



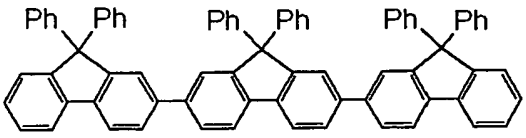
[7]-2



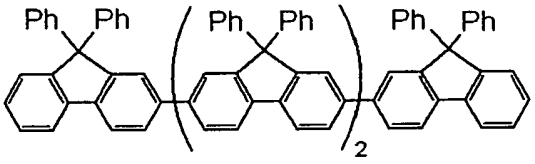
[7]-3



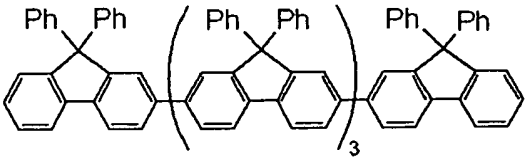
[7]-4



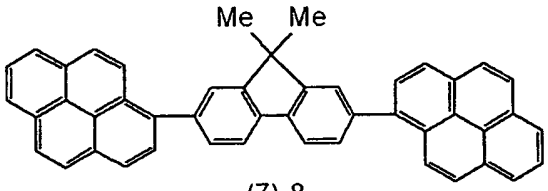
[7]-5



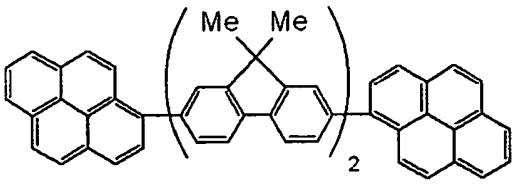
[7]-6



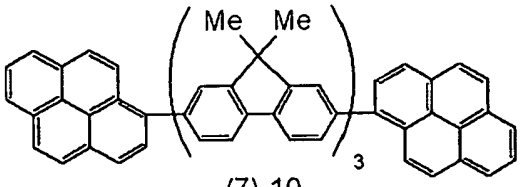
[7]-7



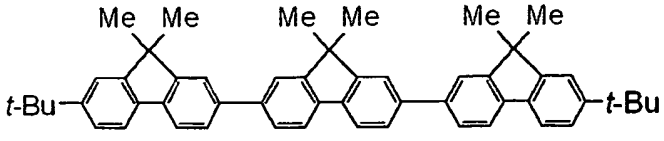
(7)-8



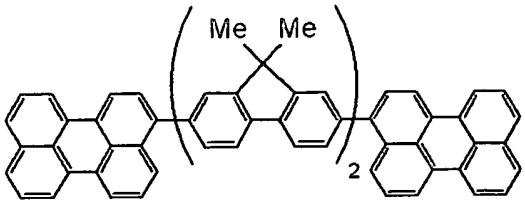
(7)-9



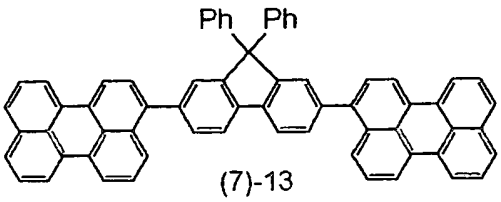
(7)-10



(7)-11



(7)-12

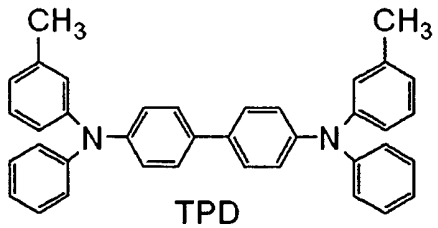


(7)-13

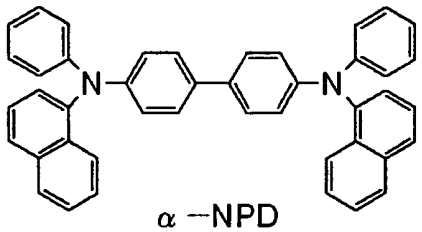
[0079]
An example with the organic desirable light emitting device of this invention is shown in drawing 1 - drawing 6 .
[0080]
Drawing 1 is the sectional view showing an example of the organic light emitting device of this invention. Drawing 1 is the thing of a configuration of having formed an anode plate 2, a luminous layer 3, and cathode 4 one by one on the substrate 1. The light emitting device used here is useful, when it is single and has hole transport ability, electron transport ability, and the luminescent engine performance by itself, or when mixing and using the compound which has each property.
[0081]
Drawing 2 is the sectional view showing other examples in the organic light emitting device of this invention. Drawing 2 is the thing of a configuration of having formed an anode plate 2, the hole transporting bed 5, the electronic transporting bed 6, and cathode 4 one by one on the substrate 1. in this case, photogene -- hole transportability -- or it is useful, when using for each layer the ingredient which electronic transportability is not but has the function of ** or both and using combining the mere hole transport matter or the electronic transport matter without the luminescence. Moreover, a luminous layer consists in this case of either the hole transporting bed 5 or the electronic transporting bed 6.
[0082]
Drawing 3 is the sectional view showing other examples in the organic light emitting device of this invention. Drawing 3 is the thing of a configuration of having formed an anode plate 2, the hole transporting bed 5, a luminous layer 3, the electronic transporting bed 6, and cathode 4 one by one on the substrate 1. Since the various compounds which differ in luminescence wavelength can be used while this separating the function of carrier transport and luminescence, and combining it hole transportability, electronic transportability, a compound with each luminescent property, and timely, using it and its degree of freedom of ingredient selection increasing extremely, diversification of a luminescent color phase is attained. Furthermore, it also becomes possible to confine each carrier or an exciton in the central luminous layer 3 effectively, and to aim at improvement in luminous efficiency.
[0083]
Drawing 4 is the sectional view showing other examples in the organic light emitting device of this invention. It is the configuration which inserted the hole impregnation layer 7 in the anode plate 2 side to drawing 3 , and drawing 4 has effectiveness in the adhesion improvement of an anode plate 2 and the hole transporting bed 5, or an injectional improvement of a hole, and is effective for low-battery-izing.
[0084]
Drawing 5 and drawing 6 are the sectional views showing other examples in the organic light emitting device of this invention. Drawing 5 and drawing 6 are the configurations which inserted the layer (a hole / exciton blocking layer 8) which checks escaping from a hole or an exciton (exciton) to a cathode 4 side to drawing 3 and drawing 4 between the luminous layer 3 and the electronic transporting bed 6. By using the very high compound of ionization potential as a hole / an exciton blocking layer 8, it is a configuration effective for improvement in luminous efficiency.
[0085]
However, drawing 1 - drawing 6 are to the last very fundamental component configurations, and the configuration of the organic light emitting device using the compound of this invention is not limited to these. For example, various lamination -- the hole transporting bed which prepares the glue line or interference layer which prepares an insulating layer in an electrode and an organic layer interface consists of two-layer [from which ionization potential differs] -- can be taken.
[0086]
The compound shown by general formula [1] - [7] used for this invention can be used with any gestalt of drawing 1 - drawing 6 . Especially the organic layer using the compound of this invention is useful as a luminous layer, an electronic transporting bed, or a hole transporting bed, and the layer formed by the vacuum deposition method, the solution applying method, etc. is [that crystallization etc. cannot take place easily] excellent in stability with the passage of time.

[0087]
Although the compound preferably shown by general formula [1] - [7] as a constituent of a luminous layer is used for the organic light emitting device of this invention, a hole transportability compound, a luminescent compound, or an electronic transportability compound known until now can also be used for it together if needed.
[0088]
These examples of a compound are given to below.
[0089]
[Formula 25]

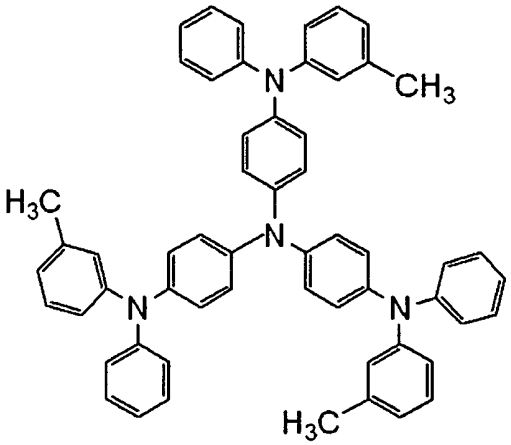
ホール輸送性化合物



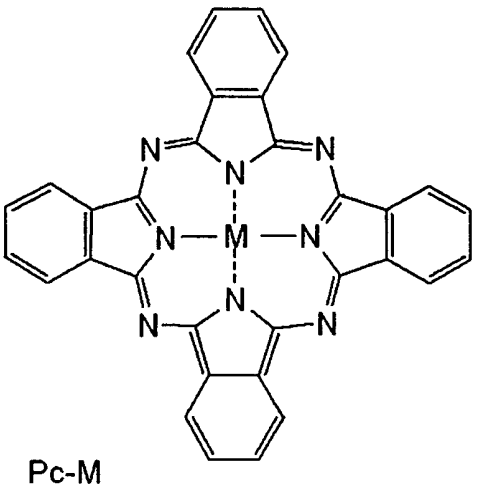
TPD



α－NPD

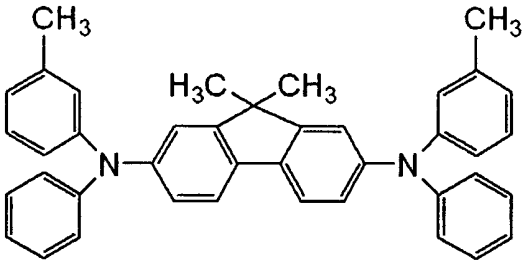


m-MTDATA

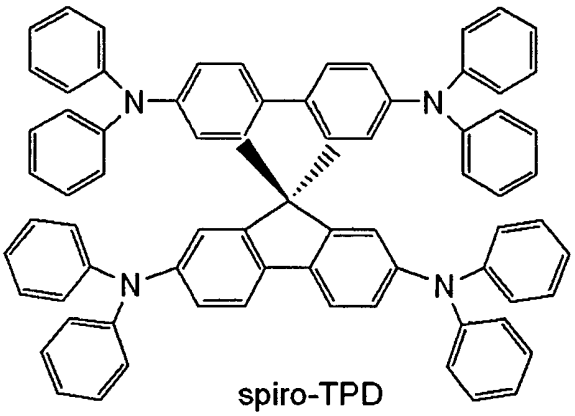


Pc-M

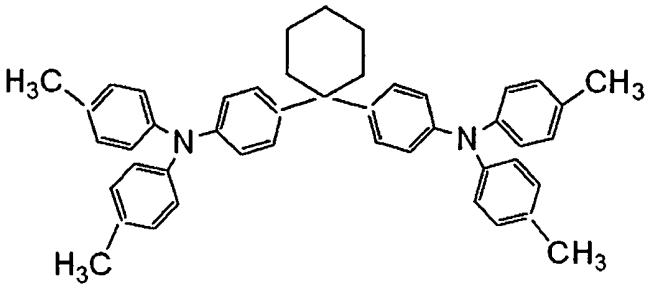
M : Cu, Mg, AlCl, TiO, $SiCl_2$, Zn , Sn, MnCl, GaCl, etc



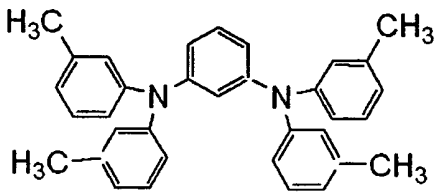
DTDPFL



spiro-TPD



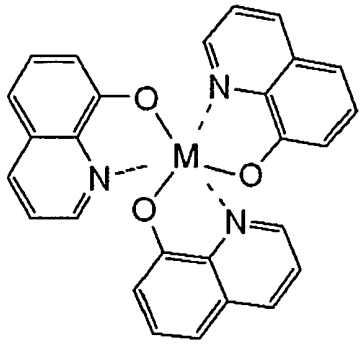
TPAC



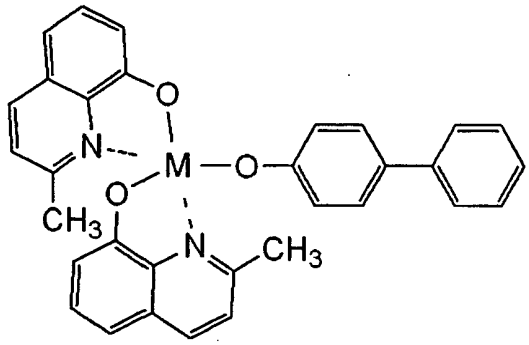
PDA

[0090]
[Formula 26]

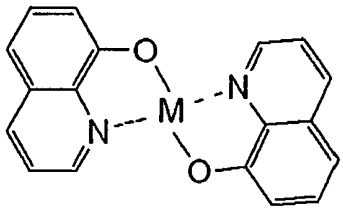
電子輸送性発光材料



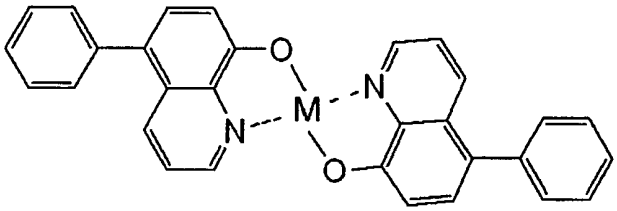
M : Al , Ga



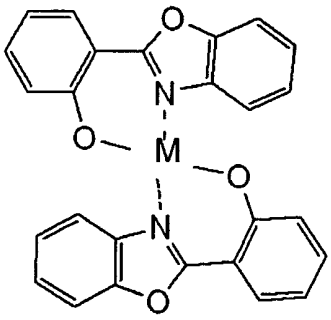
M : Al , Ga



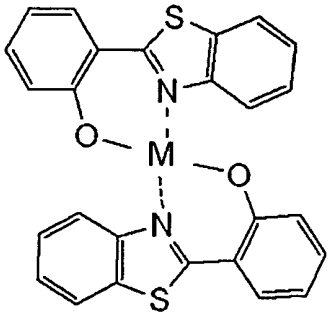
M : Zn , Mg , Be



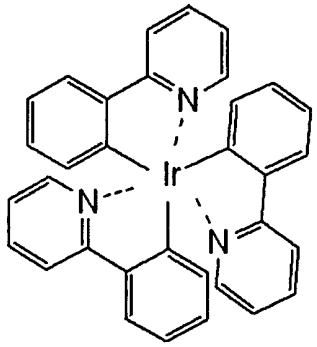
M : Zn , Mg , Be

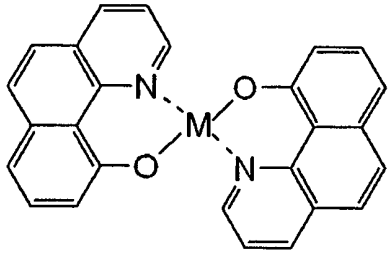


M : Zn , Mg , Be

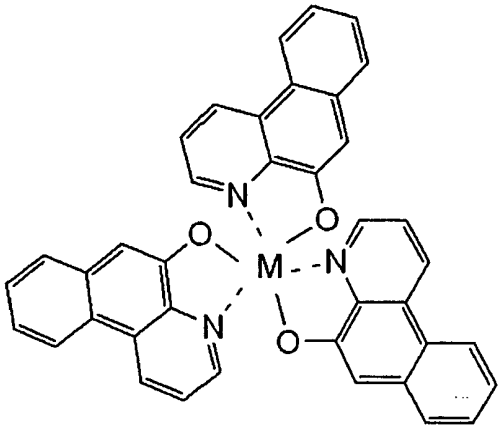


M : Zn , Mg , Be



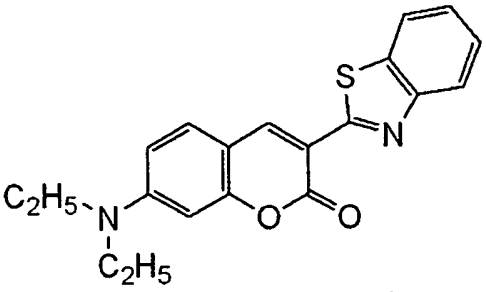


M : Zn , Mg , Be

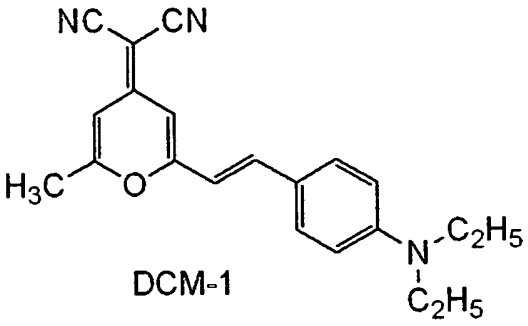


M : Al , Ga

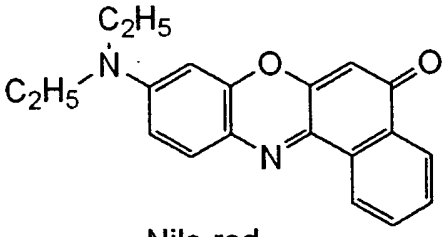
[0091]
[Formula 27]
発光材料



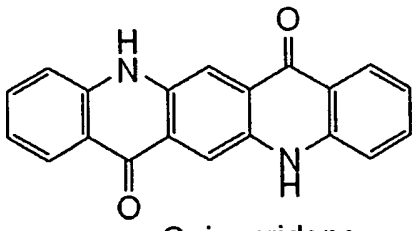
Coumarin6



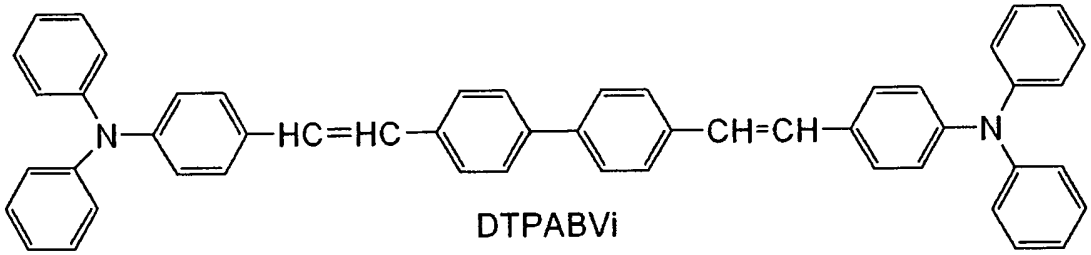
DCM-1



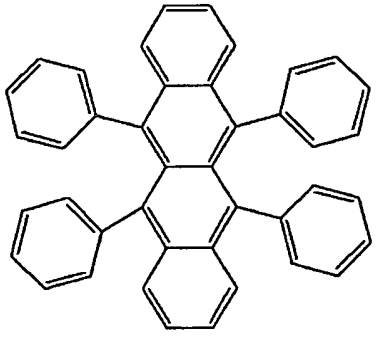
Nile red

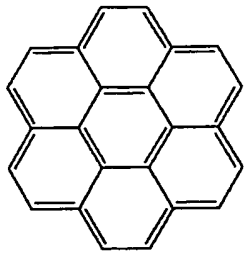


Quinacridone



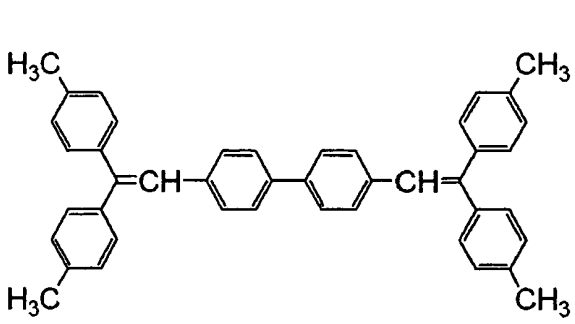
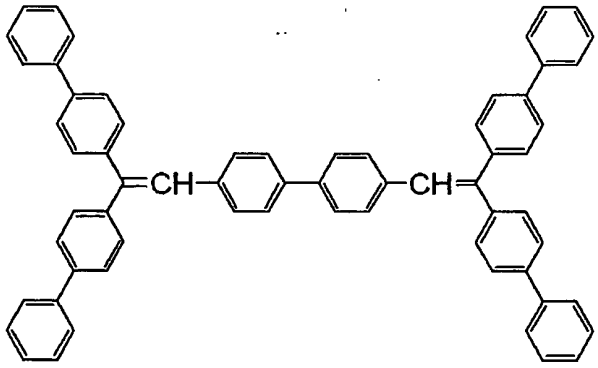
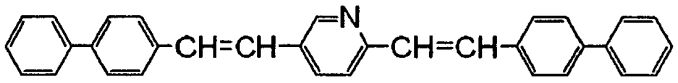
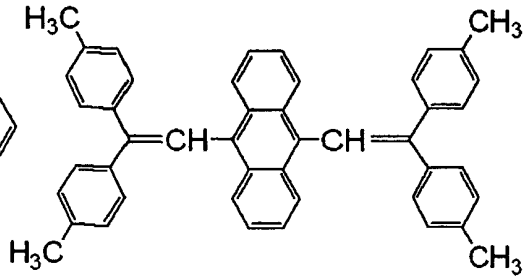
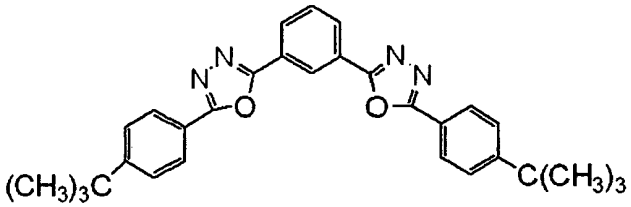
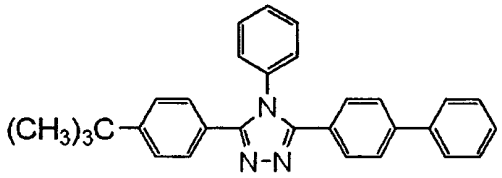
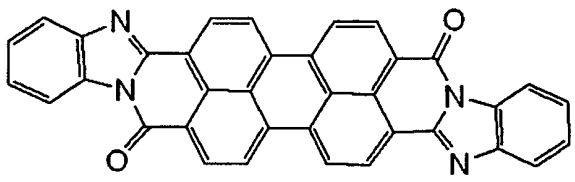
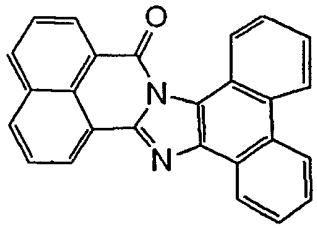
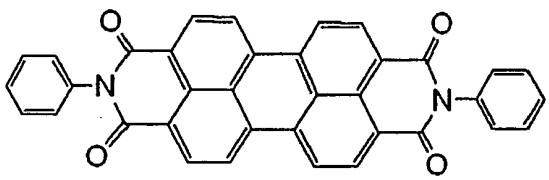
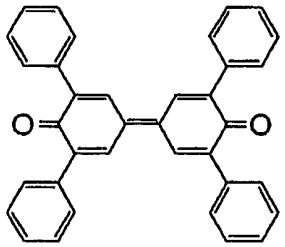
DTPABVi


Rubrene


Coronene

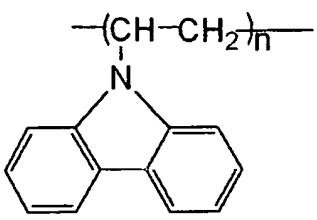
[0092]
[Formula 28]

発光層マトリックス材料および電子輸送材料

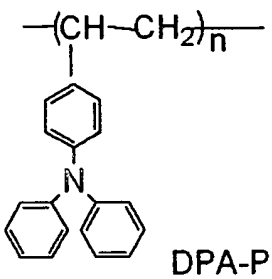











[0093]
[Formula 29]

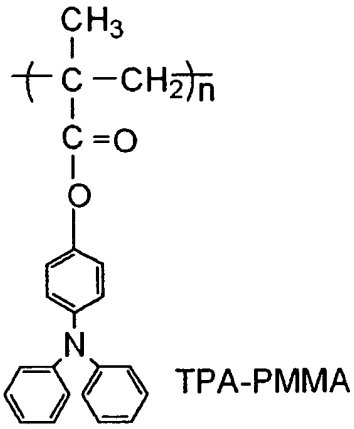
ポリマー系ホール輸送性材料



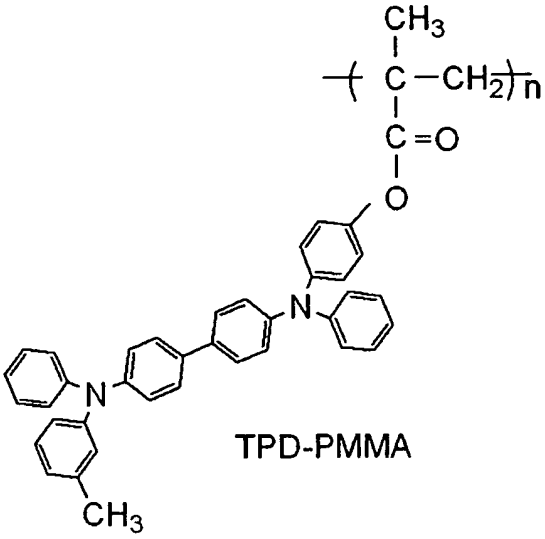
PVCz



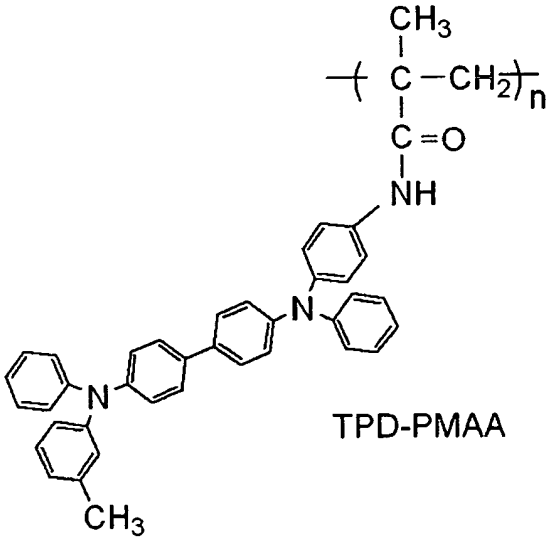
DPA-PS



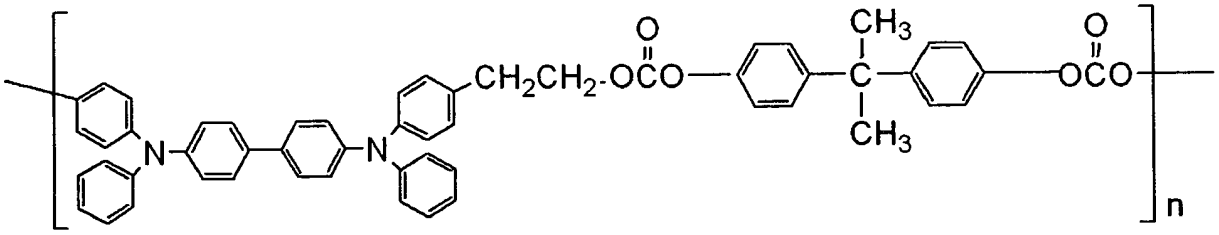
TPA-PMMA



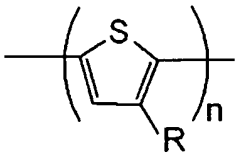
TPD-PMMA



TPD-PMAA

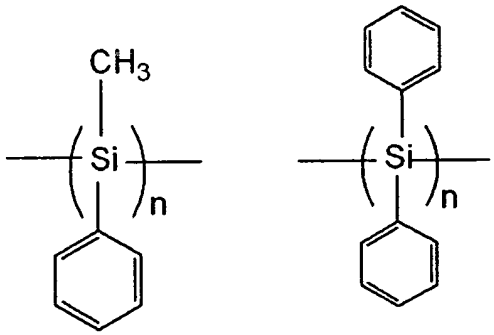


TPD-PCA



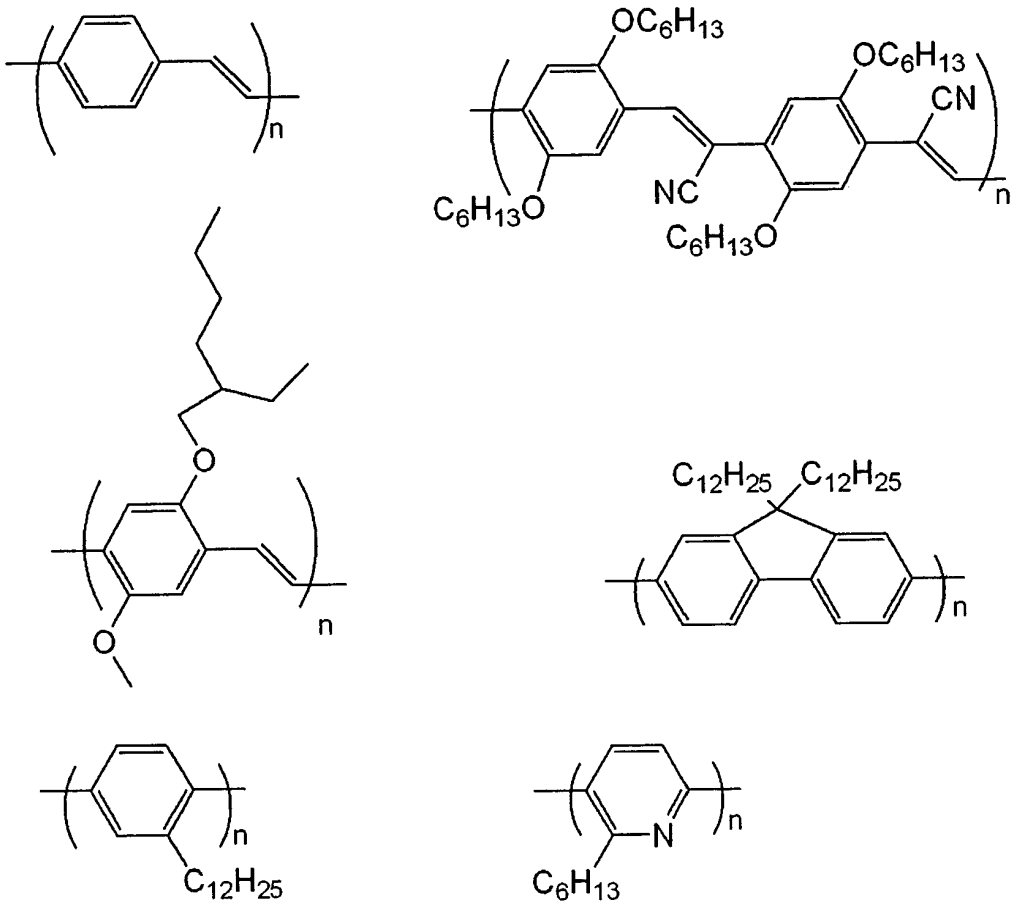
R:C_6H_{13},C_8H_{17},$C_{12}H_{25}$

Poly thiophene



Polysilane

[0094]
[Formula 30]
ポリマー系発光材料および電荷輸送性材料



[0095]
In the organic light emitting device of this invention, generally, it is made to dissolve in a vacuum deposition method or a suitable solvent, and the layer containing the organic compound of the layer containing the compound shown by general formula [1] - [7] and others forms a thin film by the applying method. When forming membranes especially by the applying method, the film can also be formed combining suitable binding resin.
[0096]
Although it can choose from bending resin wide range as the above-mentioned binding resin, for example, polyvinyl-carbazole resin, polycarbonate resin, polyester resin, polyarylate resin, polystyrene resin, acrylic resin, methacrylic resin, butyral resin, polyvinyl-acetal resin, diallyl phthalate resin, phenol resin, an epoxy resin, silicone resin, polysulfone resin, a urea-resin, etc. are mentioned, it is not limited to these. moreover -- as that these are independent or a copolymer polymer -- one sort -- or two or more sorts may be mixed.
[0097]
What has as big a work function as an anode material as possible is good, for example, metallic oxides, such as metal simple substances, such as gold, platinum, nickel, palladium, cobalt, a selenium, and vanadium, or these alloys, tin oxide, a zinc oxide, a tin oxide indium (ITO), and a zinc oxide indium, can be used. Moreover, conductive polymers,

such as the poly aniline, polypyrrole, the poly thiophene, and a polyphenylene sulfide, can also be used. Such electrode material may be used independently and can also be used together. [two or more]

[0098]

On the other hand, as a cathode material, the small thing of a work function is good and can use as a metal simple substance or two or more alloys, such as a lithium, sodium, a potassium, calcium, magnesium, aluminum, an indium, silver, lead, tin, and chromium. Utilization of metallic oxides, such as a tin oxide indium (ITO), is also possible. Moreover, a configuration is much more sufficient as cathode, and it can also take a multilayer configuration.

[0099]

Especially as a substrate used by this invention, although it does not limit, transparency substrates, such as opaque substrates, such as a metal substrate and a substrate made from the ceramics, glass, a quartz, and a plastic sheet, are used. Moreover, it is also possible to use the light filter film, the fluorescence color conversion filter film, the dielectric reflective film, etc. for a substrate, and to control coloring light.

[0100]

In addition, to the created component, a protective layer or a closure layer can also be prepared in order to prevent contact with oxygen, moisture, etc. As a protective layer, a photo-setting resin etc. is mentioned to poly membrane pans, such as inorganic material film, such as a diamond thin film, a metallic oxide, and a metal nitride, fluorine resin, poly paraxylene, polyethylene, silicone resin, and polystyrene resin. Moreover, glass, a gas impermeable film, a metal, etc. can be covered and packaging of the component itself can also be carried out with suitable closure resin.

[Example]

[0101]

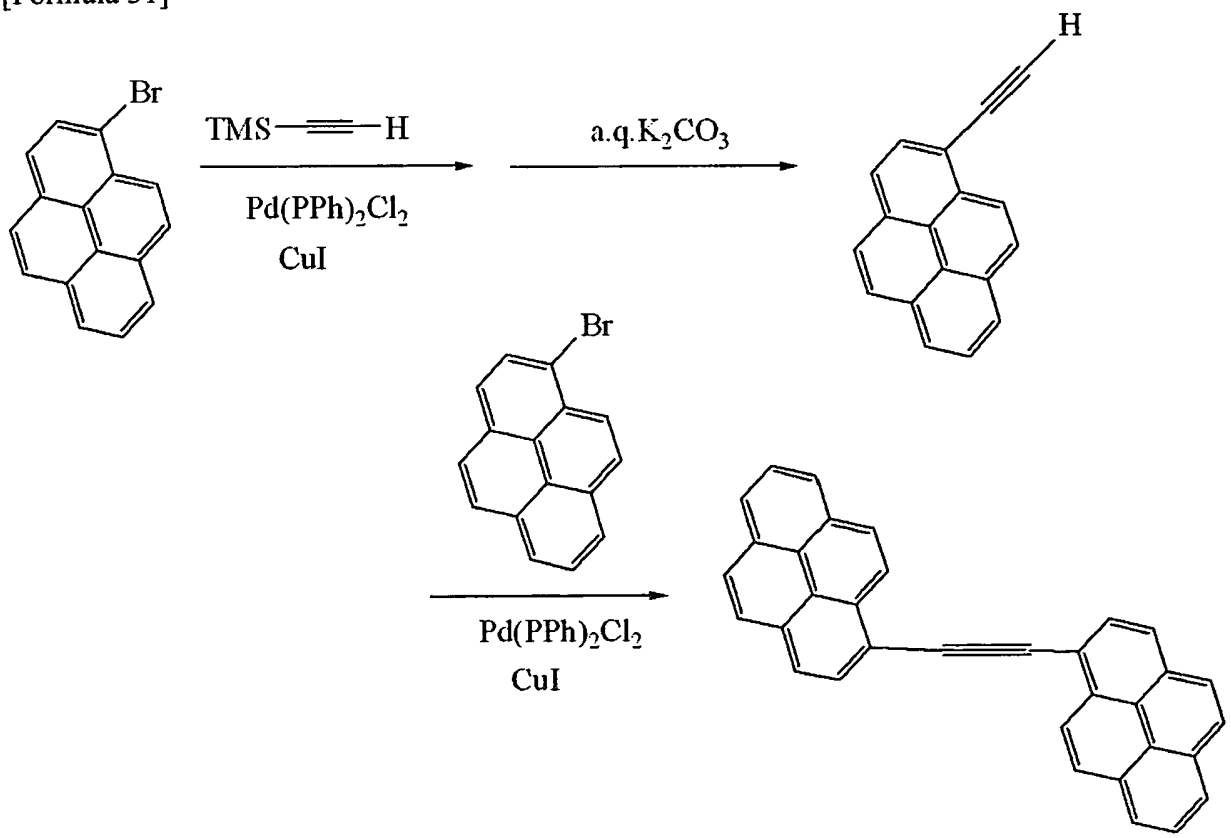
Hereafter, although the example explains this invention still more concretely, this invention is not limited to these.

[0102]

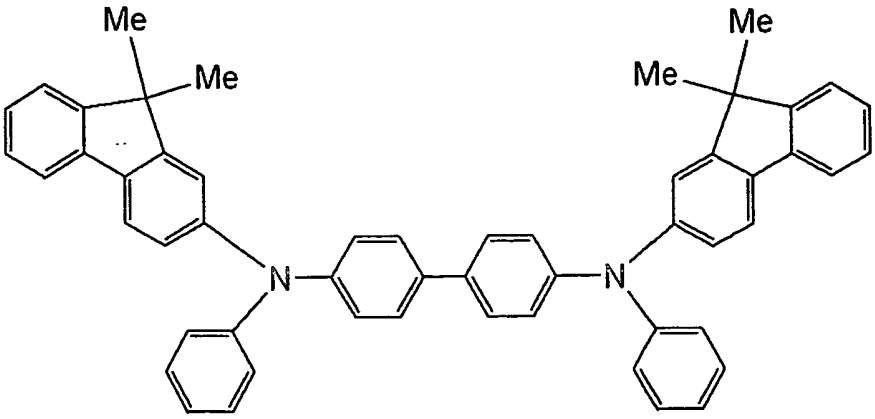
<Example 1 (instantiation compound No. [1] the manufacture approach of -1)>

[0103]

[Formula 31]



[0104]
triethylamine 100ml (solvent) which deaerated 1-BUROMO pyrene 2.8g (10mmol) and trimethylsilyl acetylene 2.8ml (20mmol) under the nitrogen air current -- it dissolved and stirred to inside and bis(triphenyl phosphine) palladium chloride 126mg (0.18mmol) and 17mg (0.18mmol) of iodine copper were added there. Heating stirring was carried out for about 5 hours on the oil bath heated at 70 degrees C. After returning a reaction solution to a room temperature, the solvent was distilled off, 50ml [of water] and toluene 100ml was added, the water layer and the organic layer were separated, the water layer was further extracted with toluene, and it dried with magnesium sulfate in accordance with the front organic layer. The solvent was distilled off, the silica gel column chromatography (expansion solvent toluene) refined residue, and 1-trimethylsilyl ethenyl pyrene 3.16g was obtained.
[0105]
1-trimethylsilyl ethenyl pyrene 3.10g (10.4mmol) was dissolved and stirred to methanol 200ml, and it added there 30ml of potassium carbonate saturated solutions. Heating stirring was carried out for about 2 hours on the oil bath heated at 70 degrees C. After returning a reaction solution to a room temperature, the methanol was distilled off, 50ml [of water] and chloroform 100ml was added, the water layer and the organic layer were separated, chloroform extracted the water layer further, and it dried with magnesium sulfate in accordance with the front organic layer. The solvent was distilled off, the silica gel column chromatography (expansion solvent toluene) refined residue, and 1-ethenyl pyrene 1.91g was obtained.
[0106]
triethylamine 100ml (solvent) which deaerated 1-ethenyl pyrene 1.8g (8.0mmol) and 1-BUROMO pyrene 3.3g (11.7mmol) under the nitrogen air current -- it dissolved and stirred to inside and bis(triphenyl phosphine) palladium chloride 126mg (0.18mmol) and 17mg (0.18mmol) of iodine copper were added there. Heating stirring was carried out for about 5 hours on the oil bath heated at 70 degrees C. After returning a reaction solution to a room temperature, the solvent was distilled off, 50ml [of water] and chloroform 100ml was added, the water layer and the organic layer were separated, chloroform extracted the water layer further, and it dried with magnesium sulfate in accordance with the front organic layer. The solvent was distilled off, the alumina column chromatography (expansion solvent toluene: hexane =1:1) refined residue, and instantiation compound [1]-1 [1.28g] was obtained.
[0107]
In addition, instantiation compound [1] -2 or subsequent ones are compoundable by using the bromine object of an aromatic series radical and a heterocycle radical similarly.
[0108]
<Example 2>
It created by the approach of showing below the organic light emitting device of the structure shown in drawing 3 .
[0109]
On the glass substrate as a substrate 1, what formed the tin oxide indium (ITO) as an anode plate 2 by 120nm thickness in the spatter was used as a transparent conductive support substrate. Sequential ultrasonic cleaning of this was carried out by the acetone and isopropyl alcohol (IPA), and, subsequently it dried after boiling washing by IPA. Furthermore, what carried out UV / ozone washing was used as a transparent conductive support substrate.
[0110]
Using the compound shown with the following structure expression as an electron hole transport ingredient, the chloroform solution was adjusted so that concentration might become 0.5wt(s)%.
[0111]
[Formula 32]



[0112]
This solution was dropped on the above-mentioned anode plate 2, first, by the revolution of 500RPM, for 10 seconds, it performed, the spin coat was performed for 1 minute, and film formation was carried out by the revolution of 1000RPM next. It dried in 80-degree C vacuum oven for 10 minutes after this, and the solvent in a thin film was removed thoroughly. The thickness of the formed TPD film (hole transporting bed 5) was 50nm.
[0113]
Next, on the hole transporting bed 5, instantiation compound No.[1]-7 were vapor-deposited as a luminous layer 3, and the 20nm luminous layer 3 was formed. The degree of vacuum at the time of vacuum evaporationo formed 1.0x10 to 4 Pa, and a membrane formation rate on condition that 0.2 - 0.3 nm/sec.
[0114]
Furthermore, aluminum quinolinol (Alq3) was formed in 40nm thickness with the vacuum deposition method as an electronic transporting bed 6. The degree of vacuum at the time of vacuum evaporationo formed 1.0x10 to 4 Pa, and a membrane formation rate on condition that 0.2 - 0.3 nm/sec.
[0115]
Next, using the vacuum evaporationo ingredient which consists of an aluminium-lithium alloy (lithium concentration 1 atom %), the metal layer membrane with a thickness of 10nm was formed with the vacuum deposition method on the organic layer like the point, the aluminum film with a thickness of 150nm was further prepared with the vacuum deposition method, and the organic light emitting device which makes the aluminium-lithium alloy film an electronic notes telegram pole (cathode 4) was created. The degree of vacuum at the time of vacuum evaporationo formed 1.0x10 to 4 Pa, and a membrane formation rate on condition that 1.0 - 1.2 nm/sec.
[0116]
The obtained organic EL device put the glass plate for protection in the dry air ambient atmosphere, and closed it with the acrylic resin system binder so that component degradation might not take place by adsorption of moisture.
[0117]
Thus, the ITO electrode (anode plate 2) was used the obtained component, the positive electrode and the aluminum-Li electrode (cathode 4) were used as the negative electrode, and blue luminescence of luminescence brightness 550 cd/m2, highest brightness 7000 cd/m2, and luminous efficiency 0.890 m/W was observed with the applied voltage of 6V.
[0118]
<Examples 3-11>
Instantiation compound [1] It replaced with -7, and except having used the instantiation compound shown in a table 19, the component was created like the example 2 and same assessment was performed. The result is shown in a table 19.
[0119]
[A table 19]

実施例	例示化合物 No.	印加電圧 (V)	輝度 (cd/m²)	最高輝度 (cd/m²)	効率 (lm/W)
3	[1]－10	6	600	5900	0.73
4	[1]－18	6	400	4100	0.55
5	[1]－19	6	890	7200	0.82
6	[1]－26	6	780	6400	0.70
7	[1]－60	6	560	7100	0.76
8	[1]－73	6	880	7700	0.88
9	[1]－81	6	860	6200	0.75
10	[1]－113	6	600	6500	0.79
11	[1]－126	6	900	7800	0.92

[0120]
<Example 12>
Instantiation compound No.[1]-7 (guest) and instantiation compound No. [2] The component was created like the example 2 except having carried out vapor codeposition of -1 (host) (weight ratio 1:100), and having formed the 30nm luminous layer 3.
[0121]
Thus, the ITO electrode (anode plate 2) was used the obtained component, the positive electrode and the aluminum-Li electrode (cathode 4) were used as the negative electrode, and blue luminescence of luminescence brightness 600 cd/m2, the highest brightness of 14800 cds/m2, and luminous efficiency 1.8 lm/W was observed with the applied voltage of 7V.
[0122]
<Examples 13-20>
Instantiation compound [1]-7 (guest) and instantiation compound No. [2] It replaced with -1 (host), and except having used the instantiation compound shown in a table 20, the component was created like the example 12 and same assessment was performed. The result is shown in a table 20.
[0123]
[A table 20]

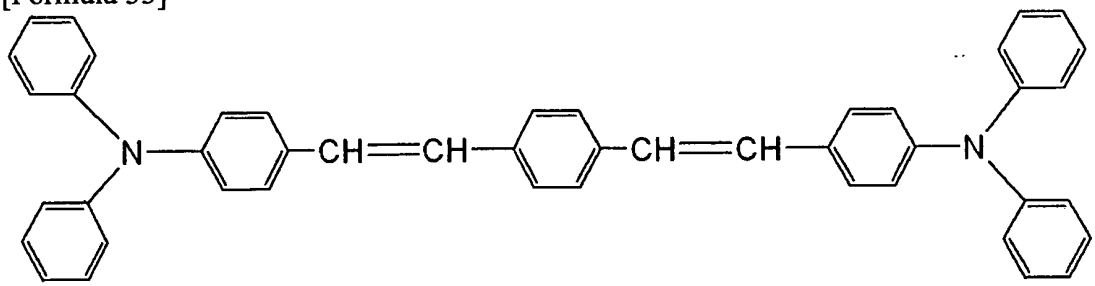
実施例	例示化合物 No. (ゲスト)	例示化合物 No. (ホスト)	印加電圧 (V)	輝度 (cd/m²)	最高輝度 (cd/m²)	効率 (lm/W)
13	[1]−9	[2]−7	7	300	11000	1.10
14	[1]−10	[2]−7	7	350	12600	1.29
15	[1]−20	[2]−1	7	600	13700	1.40
16	[1]−26	[2]−10	7	450	12800	1.05
17	[1]−28	[2]−1	7	500	12500	1.12
18	[1]−60	[1]−7	7	720	15000	1.45
19	[1]−73	[1]−7	7	770	15600	1.50
20	[1]−81	[1]−1	7	850	17000	1.62
21	[1]−9	[2]−7	7	300	11000	1.10
22	[1]−76	[2]−10	7	950	18600	2.09
23	[1]−91	[2]−12	7	1000	19500	2.40
24	[1]−20	[3]−1	7	550	12600	1.20
25	[1]−26	[3]−4	7	460	12300	1.02
26	[1]−28	[3]−4	7	490	11300	1.08
27	[1]−60	[3]−1	7	630	13400	1.34
28	[1]−73	[3]−7	7	670	13600	1.36
29	[1]−81	[3]−7	7	790	16500	1.52
30	[1]−76	[3]−9	7	850	17800	2.03
31	[1]−91	[3]−11	7	990	18800	2.34
32	[1]−20	[4]−1	7	640	15400	1.40
33	[1]−26	[4]−5	7	760	18300	1.62
34	[1]−60	[4]−1	7	780	19900	1.76
35	[1]−81	[4]−5	7	690	15500	1.50
36	[1]−73	[4]−9	7	1050	25800	2.80
37	[1]−60	[5]−1	7	690	13900	1.36
38	[1]−81	[5]−1	7	580	12400	1.33
39	[1]−20	[6]−2	7	530	13200	1.36
40	[1]−26	[6]−2	7	680	15400	1.54
41	[1]−60	[6]−9	7	1500	24900	3.66
42	[1]−81	[6]−9	7	1590	24500	3.70
43	[1]−73	[6]−12	7	3550	55800	6.50
44	[1]−60	[7]−1	7	390	10800	0.98
45	[1]−81	[7]−1	7	380	10400	0.88

[0124]
<Examples 46-50>
The emission spectrum of the component created in the examples 12, 22, 27, 35, and 43 was observed by MCPD-7000, and the CIE chromaticity coordinate was measured. Moreover, the reduction-by-half life over initial brightness was measured by DC actuation by 3.0mlA about the created component. The result is shown in a table 21.
[0125]
[A table 21]

実施例	素子の実施例	CIE色度座標 (x, y)	半減寿命 (hour)
46	12	0.15, 0.20	6400
47	27	0.16, 0.20	6200
48	35	0.15, 0.09	7500
49	43	0.15, 0,09	7900
50	22	0.21, 0.70	5000

[0126]
<The example 1 of a comparison>
The component was created like the example 2 except having used the following styryl compound as a luminous layer 3.

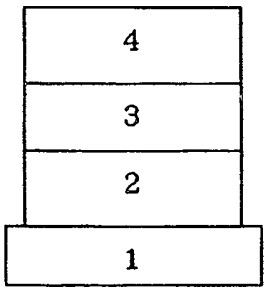
[0127]
[Formula 33]



[0128]
Thus, the ITO electrode (anode plate 2) was used the obtained component, the positive electrode and the aluminum-Li electrode (cathode 4) were used as the negative electrode, and luminescence of the blue white which the greenishness of the luminescence brightness of 120 cds/m2, highest brightness 3800 cd/m2, and luminous efficiency 0.17 lm/W cut with the applied voltage of 10V was observed.
[0129]
<The example 2 of a comparison>
The above-mentioned styryl compound and instantiation compound [4] The component was created like the example 2 except having carried out vapor codeposition of -1 (weight ratio 5:100), and having formed the 20nm luminous layer 3.
[0130]
Thus, the ITO electrode (anode plate 2) was used the obtained component, the positive electrode and the aluminum-Li electrode (cathode 4) were used as the negative electrode, and luminescence of the blue white which the greenishness of the luminescence brightness of 125 cds/m2, highest brightness 4500 cd/m2, and luminous efficiency 0.30 lm/W cut with the applied voltage of 10V was observed.
[0131]
<The example 3 of a comparison>
When the emission spectrum of the component created in the example 2 of a comparison was observed by MCPD-7000 and the CIE chromaticity coordinate was measured, it was = (x y) (0. 16 0.30).
[Brief Description of the Drawings]
[0132]
[Drawing 1] It is the sectional view showing an example of the organic light emitting device in this invention.
[Drawing 2] It is the sectional view showing other examples of the organic light emitting device in this invention.
[Drawing 3] It is the sectional view showing other examples of the organic light emitting device in this invention.
[Drawing 4] It is the sectional view showing other examples of the organic light emitting device in this invention.
[Drawing 5] It is the sectional view showing other examples of the organic light emitting device in this invention.
[Drawing 6] It is the sectional view showing other examples of the organic light emitting device in this invention.
[Description of Notations]
[0133]
1 Substrate
2 Anode Plate
3 Luminous Layer
4 Cathode
5 Hole Transporting Bed
6 Electronic Transporting Bed
7 Hole Impregnation Layer
8 Hole / Exciton Blocking Layer

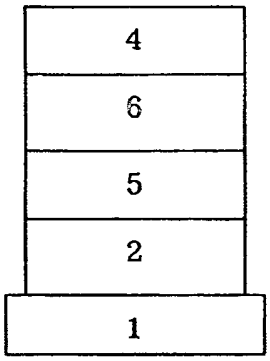
[Translation done.]

Drawing selection drawing 1



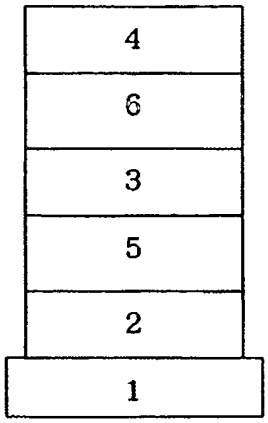
[Translation done.]

Drawing selection drawing 2



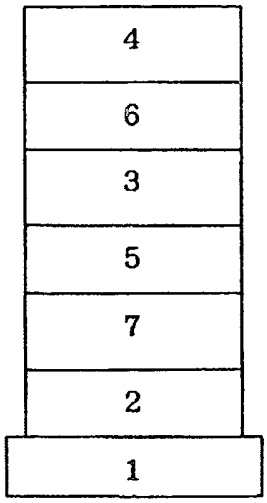
[Translation done.]

Drawing selection drawing 3



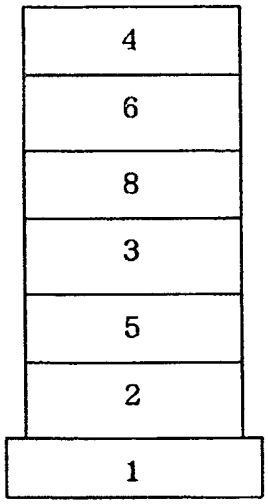
[Translation done.]

Drawing selection drawing 4



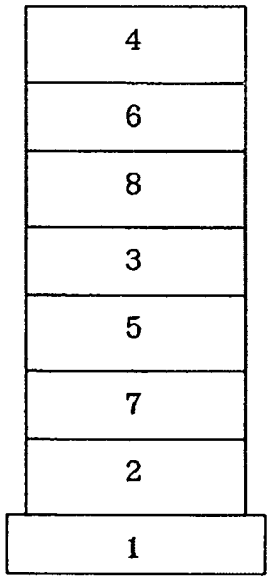
[Translation done.]

Drawing selection drawing 5



[Translation done.]

Drawing selection drawing 6



[Translation done.]